THE AUTOMOBILE

Vol. XXXVI
No. 20

NEW YORK, MAY 17, 1917

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New Super-Six Speedster

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The newest Hudson Super-Six model is a 4-passenger Speedster.

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No description of the Speedster nor any assurance of definite delivery dates was given. Still the orders continued to increase.

And why shouldn't there be such a demand for a Hudson Super-Six Speedster? Everyone knows of the official record of a stock Super-Six chassis in traveling a measured mile at the rate of 102½ miles an hour. And all motorists are familiar with other wonderful performances of the Hudson Super-Six. The Super-Six has proved it has just the qualities you would require in a Speedster.

There could be no concern about the beauty or grace or finish of the body. The artists responsible for such lines as are revealed in the Super-Six Phaeton, the grace of the Hudson Super-Six Limousine, and the daintiness of the Town Car, could be relied upon to design the smartest Speedster. You must acknowledge its low sweeping lines, its rich cobalt blue body with vermilion wheels, the smartest Speedster you have ever seen.

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Touring Sedan	2175	*(All Prices f. o. b. Detroit)*		Limousine Landaulet	3025

HUDSON SUPER SIX

HUDSON MOTOR CAR COMPANY

DETROIT, MICHIGAN

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The Automobile

Vol. XXXVI New York—Thursday, May 17, 1917—Chicago No. 20

Hope in 5% Tax Fight

Senate Finance Committee Gives Careful Attention to Industry's Statement in 40 Minute Hearing

Congressmen Begin to Show a Sympathy with Manufacturers That Was Entirely Lacking Last Week

Leaders Realize Industry at Large Cannot Be Judged By Profits of the Few Companies with Large Outputs

WASHINGTON, D. C., May 12.—The automobile industry was given 40 min. to-day to show why the 5 per cent tax on automobiles at the source of manufacture should not become law, and also how it would injure 80 to 85 per cent of the industry. Owing to the shortness of time, a general statement was given by Alfred Reeves, general manager of the A. A. C. C., and in addition several other representatives of the industry addressed the Senate Finance Committee before whom the hearing was held. Others who addressed the committee were Thomas Henderson, Winton; Elwood Haynes, Haynes; F. I. Burrows, Lexington-Howard; Dr. Crow, Crow-Elkhart; and A. B. Hardy, Chevrolet.

The Senate Finance Committee gave careful attention to the hearing, and during the present week Congressmen are showing the sympathy with the automobile manufacturers which was entirely wanting a week ago. It is now very evident that Congressmen see how erroneous it is to estimate the entire industry by the success of Ford and one or two other large producers.

Thomas Henderson, one of the original partners in the Winton Co., told the committee that with the wide experience of his company it would not be possible to pay the 5 per cent tax and come out on the right side of the ledger. He quoted figures showing a profit in 1914 of 6 per cent, and in 1915, 3 per cent, all of which would be eliminated by the 5 per cent tax. He showed further that in 1916 the net profit was 4 2/5 per cent on a business of $9,000,000.

A. B. C. Hardy of Flint, Mich., vice-president of the Chevrolet, told the senators of the increasing cost of materials; how frame steel has gone up in the last 18 months from $1.35 to $5.35 per cwt., other grades from $2.75 to $8; castings from $13.35 per ton to $43; lumber over 100 per cent and fabrics even higher. He pointed out that all these increased costs for materials had been absorbed by the manufacturer with very slight if any increase in price of cars—but if this 5 per cent tax on the sales price is to be tied on top of everything else it will paralyze the business.

Dr. E. C. Crow, of the Crow-Elkhart car, Elkhart, Ind., spoke for the smaller dealers, declaring the tax will constitute 33⅓ per cent of his capital.

Senator R. J. McCumber of North Dakota and a member of the Senate Finance Committee showed a genuine appreciation of the situation by bringing out the fact that no imposition of burden can be placed on such a competitive industry without disturbing the whole structure. He asked: "Isn't it true that a lot of the medium-priced cars are having difficulty selling their cars against the competition of cheaper cars?" and that being answered in the affirmative, he continued: "Is it not true that imposition of this tax will either compel the medium-priced manufacturer to absorb the tax or else succumb to the competition of the cheaper car?" The senator was assured that it meant ruin either way.

The 5% Tax

"Upon all automobiles, automobile trucks, automobile wagons, and motorcycles, and automobile, motorcycle or bicycle tires (including inner tubes) sold by the manufacturer, producer, or importer, a tax equivalent to 5 per centum of the price for which so sold, provided that from the tax which otherwise would be imposed on a manufacturer, producer, or importer of automobiles, automobile trucks, automobile wagons, or motorcycles, there shall be deducted the amount of any tax imposed by this subdivision upon the tires used thereon."

Why Not Here?

"Upon all yachts, pleasure boats, motor-boats and other vessels NOT USED OR INTENDED TO BE USED FOR TRADE."

Congressmen Doremus and Kelley, of Michigan, are preparing for the most vigorous kind of a fight on the floor when the house reaches the automobile section. They realize that the situation is extremely serious and are not holding out any assurances of being able to save the industry, but they are gaining converts steadily.

Ask Tax on Profits

At a meeting held Friday night by the automobile manufacturers the proposition was broached to ask Congress in lieu of this 5 per cent sales price tax to impose on the industry an excess profits tax over and above the exempted 8 per cent, of 25 per cent.

The war revenue bill is going to increase the existing excess profits tax from 8 to 16 per cent. The automobile men's idea is that if the Government wishes to single them out for additional burden they would rather have it taken in the form of an extra-excess profits tax than as a tax on sales.

This suggestion will be made to the House of Representatives—if the automobile men agree to it—and will be presented by one of the Michigan members in the form of an amendment.

Significant Statistics

Alfred Reeves, in the general brief which he read to the Finance Committee, gave many interesting figures with regard to the automobile industry. He opened by showing that twelve manufacturers produce 80 per cent of the cars and that 438 manufacturers produce but 20 per cent. After stating that the industry has been obliged to increase its cost of labor 25 per cent he gave interesting figures concerning the status of the industry. There are 450 manufacturers of automobiles located in thirty-two States; there are 825 manufacturers of parts and accessories located in practically every State in the Union; there are 25,924 automobile dealers; there are 23,686 garages; and several other organizations, all of which depend on the products of the automobile manufacturers. Fourteen automobile companies employ 145,000 men. If you add to this an average of 300 men for each of the remaining companies you get 135,000 additional, or a total of 280,000 wage earners in the automobile industry. To this you must add 350,000 employed in the manufacture of bodies, parts, materials and accessories. Add to this 150,000 in the employ of dealers. Add another 75,000 employed by the garages. Add 50,000 more who work in the 12,171 machine shops. Finally add 10,000 who work in the 2500 automobile supply houses. These figures give a grand total of 65,556 concerns or factories directly or indirectly connected with the automobile industry. These employ 915,000 wage earners. The dependents on these approximate 3,000,000 people.

Figures presented by Mr. Reeves show that 718 automobile manufacturers have failed in the past 5 years, and that the mortality in the industry has been greater than that in any other healthy industry during a similar period. Owing to top-notch prices for material and labor, profits from automobile concerns are less than three-fourths of what they were a year ago.

One possible injury that would come to the industry because of the 5 per cent tax was that new sales would be greatly restricted because four-fifths of the cars sold last year, exclusive of Fords, were sold on a trading basis, the dealer taking a used car in return. If present prices on new cars are increased by the 5 per cent tax it will mean many owners will keep their old cars instead of buying new ones.

The error in classifying motor trucks as a luxury was taken up by the brief which showed that trucks are doing a wonderful transportation work in getting the farm products to the city market, which is one of the national problems of to-day.

Plants in 32 States

The brief refuted the argument that only one or two States, such as Michigan and Indiana, are really interested in the automobile industry. There are automobile factories in thirty-two of the forty-eight States.

According to the latest information with regard to the 5 per cent tax, it is understood the law will apply on cars held by dealers at the time the law goes into effect. This might also be interpreted to mean used cars that the dealer has on hand at that time. So far as the manufacturer is concerned the law would apply to all cars he sells after the law takes effect. At present dealers have on hand cars worth many millions of dollars and should the law tax these cars it would be very serious for the dealers. Should the law apply to used cars a still heavier burden would fall on the dealer.

Effect Widespread

This 5 per cent law will not all fall on the automobile manufacturer, as indicated herewith. Local bankers who have been financing automobile dealers in taking on stocks of cars during the winter are equally interested in the 5 per cent tax. Dealers and garage owners throughout the country are all interested in it. ALL SHOULD USE THEIR INFLUENCE WITH THEIR SENATORS WHEN OPPOSING THE MOVEMENT.

Among protests sent from all parts of the country to members of Congress on the tax were 3000 telegrams from members of the Boston Automobile Dealers' Assn. The Atlanta Automobile Assn. has also protested against the tax. Congressman Gallivan of Massachusetts has assured the Boston association that he will oppose the tax.

5% Tax Means Failures

718 automobile manufacturers alone failed or retired from business in the past 5 years. This was under normal conditions and does not include accessory makers and dealers. If the 5 per cent tax on car, truck and tire sales at the plant becomes law, there will be many more failures.

Every manufacturer and dealer in the automobile, motor truck and tire fields should write or wire his protest at once to the following committee in Washington:

Senate Finance Committee

F. McL. Simmons.North Carolina
W. J. Stone.....Missouri
J. S. Williams.....Mississippi
Hoke Smith.....Georgia
Charles S. Thomas.....Colorado
William Hughes.....New Jersey
Ollie M. James.....Kentucky
Thomas P. Gore.....Oklahoma
A. A. Jones.....New Mexico
Peter G. Gerry.....Rhode Island
Boies Penrose .....Pennsylvania
H. C. Lodge.....Massachusetts
P. J. McCumber....North Dakota
Reed Smoot .....Utah
J. H. Gallinger....New Hampshire
Robert M. LaFollette...Wisconsin
C. E. Townsend.....Michigan

Olds Member of Burgesses Corps

LANSING, MICH., May 15—R. E. Olds, president of the Reo Motor Car Co., has been elected a life member of the Burgesses Corps to fill the vacancy caused by the death of ex-governor Curtis Guild of New York. The Burgesses corps is the oldest military organization in this country and has honored many famous men, including rulers of other lands. The Burgesses corps was originally organized in 1691 for the purpose of defending the settlement of colonists at Albany, New York. Its armory is located at Albany, N. Y., and it has served with distinction in all of the wars and in events social and otherwise during its existence.

Technical Society Talks Manufacture

FLINT, MICH., May 13—The Automobile Technical Society held a meeting here last night. J. D. Dort, president of the Dort Motor Car Co., addressed the members on technically trained men and told of the new era dawning in the manufacturing world. He urged the men to take special training and to become expert in some particular line. Etienne Planché, chief engineer of the Dort company, spoke of the manufacture of motors. He declared that American manufacturers have been too busy with the quantity and neglected the quality of engines. Other speakers were: W. M. Power, president of the society; R. J. Wise, industrial secretary of the Y. M. C. A.; A. M. Averill of the Dort company and J. E. White. George Anderson, of the Mason Motor Co., provided entertainment.

M. & A. M. Fights 5% War Tax

Brief to Members of Congress Predicts Effect on Accessory Industry

NEW YORK, May 16—The effect on the manufacturers of engines, parts and accessories of the proposed 5 per cent government tax on the sale price of automobiles is clearly set forth in a brief which is being sent to the members of Congress by the Motor and Accessory Manufacturers' Assn.

Nearly 650,000 men and women in this field are affected. The gross annual business of these organizations varies from $36,013.36 to $100,000,000.

The brief follows:

TO THE MEMBERS OF CONGRESS:

Recent referendum votes by the 266 members of *The Motor and Accessory Manufacturers Association conclusively prove that they are in favor of preferential delivery of their products to the Government at reasonable profit;* in favor of conscription; in favor of shouldering their share of just taxation; in favor of universal taxation on stamps, checks, commercial paper, etc., which would be borne by all citizens of the United States; *but that the association is opposed to unjust and discriminating tax on the automobile industry.*

The tax of 5 per cent proposed to be levied upon the automobile manufacturer is certain to seriously affect all manufacturers of motors, parts and accessories. No automobile manufacturer in the United States manufactures his car complete. Members of The Motor and Accessory Manufacturers Association manufacture the component parts of all automobiles, trucks, tractors, airplanes, bicycles, motorcycles and motor boats, made in the United States, so it can be readily seen that any taxation imposed upon the motor car manufacturer directly affects the manufacturer of motors, parts and accessories.

A very large percentage of parts, such as frames, springs, magnetos, etc., are built upon specifications furnished to the parts manufacturer by the maker of the complete car. Excessive taxation on the complete motor car manufacturer will unquestionably eliminate many of them from business, which in turn, will react on the parts makers with whom they are doing business. In consequence, thousands of employees, both men and women, will be thrown out of work.

Parts made for one manufacturer cannot be resold to another manufacturer, as these parts would not fit and consequently these parts would be a total loss to the parts manufacturer. No motor car manufacturer makes his spark plugs, wheels, tires, magnetos and various other component parts. A great many motor car manufacturers assemble into the complete car those parts furnished him by members of The Motor and Accessory Manufacturers. Some motor car manufacturers make their own frames, while others do not. Some make their own motors, but the majority are furnished by the motor manufacturers.

While it is impossible to furnish exact figures of total capitalization; gross volume of annual business; number of persons employed and the gross weekly payrolls, it may be stated that the capitalization of the 266 members of the association approximates one billion dollars.

The number of persons employed, both men and women, will easily reach 650,000. *In our membership are organizations employing from* 10 *to* 25,000 *persons, paying weekly salaries ranging from* $138.08 *to approximately* $400,000. *The gross annual business of these organizations varies from* $36,013.36 *to* $100,000,000. These figures do not by any means show actual net profits, which, by the way, do not compare with what they were prior to the war.

The motor and parts business has been compelled to increase its costs for labor and materials due to increasing prices in raw materials and the scarcity of labor. Forgings, leather, sheet steel, steel tubing, iron castings, steel castings, aluminum castings, bearings, etc., have all increased in price, thus forcing the maker of motors, parts and accessories to charge the complete automobile manufacturer more than was necessary prior to the war. Many makers of motors, parts and accessories are not making a legitimate profit.

It is very doubtful whether the automobile buying public would absorb this increased tax, as the price of automobiles, prior to this proposed taxation, has been increased in many instances two and three times. Automobiles are now selling considerably above normal price, all of which has a tendency to curtail production. Such a tax might be possible when prices were being reduced, but to-day when an $800 car is selling for $1,050 it would not seem that there is a possible chance of charging this additional 5 per cent to the consumer.

Members of this association feel that there could not have been a more unfortunate time to have the price of automobiles increased than at the present. Retrenchments are being made in the purchase of automobiles throughout the country. Thousands of owners of used cars who contemplated buying new machines are content with the old model for a year or perhaps longer. *Already production is being curtailed from* 25 *to* 40 *per cent by many manufacturers and others will have to follow in their wake.* As reduction of output is increased, manufacturing costs inevitably increase. Quantity production of motors, parts and accessories as well as the complete motor car has always been a predominating feature in the retail sales price. The 266 manufacturers allied with the Motor and Accessory Manufacturers Association petition you to give unusual consideration to the above facts and ask that you do not unjustly overburden the motor car industry with taxation.

Rubber Assn. Fights War Tax

Double Tax on Tires and Tubes Amounts to 15 Per Cent—Imports Affected

NEW YORK, May 12—The Rubber Assn. of America, through its legislative committee, is leading the opposition to the recent war tax measure, which places two taxes on tires and inner tubes. There is a 5 per cent tax to be paid by the manufacturer on the selling price of tires and inner tubes to dealers. There is also a flat import duty of 10 per cent on crude rubber imported. Heretofore crude rubber has been on the free list, but the action of the Ways and Means Committee in making an arbitrary import tax of 10 per cent on all free list articles places a double war tax on the rubber industry, in addition to the many other taxes which will fall on the industry, such as excess profits, corporation tax, income tax, freight, express, etc.

It is nothing short of sheer injustice to put a double tax on tires, which are such an essential in war times. The Rubber association hopes that at least the 10 per cent import tax will be removed. There is no crude rubber raised in this country. Rubber is one of the great essentials of war. Because of this it is hoped to get this tax removed.

The legislative committee of the Rubber Assn. of America consists of Frederick C. Hood of the Hood Rubber Co., H. Stewart Hotchkiss of the U. S. Rubber Co., and George B. Hodgman of the Hodgman Rubber Co. This committee has arranged for a hearing before the Finance Committee of the Senate.

During the fiscal year ending Dec. 31, 1916, there were 115,000 tons of crude rubber imported into this country. This figure represents long tons, or 2240 lb. Crude has averaged 80 cents per lb. The present duty will be an ad valorem tax, which would make it difficult to calculate, and if such a tax eventually goes through the rubber importers would prefer something specific.

—

Truck Club Adds 500 Members

NEW YORK, May 14—Two hundred new members were added to the Motor Truck Club of America as a result of a 4-day intensified campaign carried on by ninety of the present club members who formed themselves into thirty committees of three each and personally invited prospective members to join the club.

Many committees reported that they could not secure memberships in some instances because those in authority were not in their offices. As a result, these prospects will be followed up during the following week and one additional day, Friday, May 18, will be given over to a last intensified effort to bring all such prospective members into the club. It is estimated that this work will result in 500 new members.

S. A. E. Meeting Plans Settled

Secretary of War Baker to Speak at Dinner—Valuable Papers Scheduled

WASHINGTON, May 15—Definite plans concerning the summer meeting of the Society of Automotive Engineers, to be held at the Bureau of Standards, in this city June 25-26, were settled at the monthly meeting of the council of the society, which was held in its new offices in the Munsey Building to-day.

The informal dinner will be held in the banquet hall of the New Willard Hotel, Tuesday evening, June 26. Secretary of War Newton Baker has accepted an invitation to be present, and will address the engineers. The other speakers have not been decided upon as yet. The dinner will be $6 per plate, and members are asked to make reservations through the New York office of the S. A. E. It is expected that this dinner will be the greatest get-together of the government officials and S. A. E. members in the history of the society. Over thirty guests representing the Army and Navy from Washington will be present, and in addition the Council of National Defense and other organizations cooperating with the Government at the present time will be invited.

Professional Session

The professional session on Tuesday, June 26, will be one of particular interest. The majority of the papers to be presented have already been decided upon and they all will be of a practical type. Wing Commander I. W. Sedden, R. N. A. S., who is a member of the British Commission in this country, and who is demonstrating some of the British types of war aeroplanes here, has agreed to present a paper dealing with the practical aspects of aeroplane manufacture, and to include much other information which manufacturers and engineers are greatly in need of. Commander Sedden has had much practical experience on the Somme front.

Major Rees, also of the British Commission, and an experienced British aviator throughout the entire Somme campaign, and who accompanied the commission to give practical information on what aeroplanes of different types are actually called upon to do, has practically agreed to answer various questions on this interesting subject.

Motor Trucks in European War

The matter of motor trucks in the European war is being handled by W. Owen Thomas, consulting engineer of Detroit, and who for over 2 years was head of military motor transport work for the Canadian government under Major-General Sam Hughes, who was Minister of Militia for Canada. Mr. Thomas was on the French and British front for 14 months.

H. L. Horning, of the Waukesha Motor Co., is preparing a practical paper on farm tractors. Last year 35,000 farm tractors were manufactured. It was hoped this year to manufacture 70,000 but shortage of material and labor has cut this down. Mr. Horning has been co-operating with the Department of Agriculture demonstrating how the tractors in present use are averaging 48 days per year work, which is only one-third of their capacity. Plans are under way to show how farm tractors can greatly co-operate with the government in the food problem at the present time.

The motor boat end of the S. A. E. will be represented by Henry R. Sutphen, vice-president of the Submarine Boat Corp., who will give an illustrated talk on standardization methods used and production plans in building the 500 submarine chasers which this country built for the British government. The illustrations will be in the form of three reels of movie films covering the complete scope of the work. The films will be accompanied by explanations by Mr. Sutphen.

The professional session will be held at the Bureau of Standards, as will the Monday meeting of the standards committee. Arrangements have been made with the Bureau for the serving of luncheon each day on the lawn so that there will be little disturbance from the daily sessions which are scheduled to begin at 10 o'clock and continue until 4:30 o'clock.

Through the courtesy of the Bureau of Standards, it has been arranged to have an inspection of the various departments of the Bureau on the afternoon of Monday, June 25, beginning at 3 p. m. It is more than possible that special demonstrations of testing materials, etc., will be arranged for at that time.

The society is not undertaking to make any arrangements with regard to hotel reservations of members attending the meeting. The Washington hotels, in spite of the present activities, will have ample accommodations for all members, but the 1917 meetings committee recommends that members make reservations at once. Headquarters of the society will be at the New Willard Hotel.

It is expected that over 800 members of the society will be present at the meeting and the dinner. Washington is, in addition to being the political capital, the hub of interest to-day. The large offices of the Council of National Defense are filled with representatives of industries from all parts of the country. Practically every manufacturer has some interests in Washington at present. The same applies to the engineers. June 25-26 will see the greatest number of representatives of the S. A. E. in the capital that have ever gathered there.

—

Willys' Personal Tax on $1,075,300

TOLEDO, May 14—John N. Willys, president of the Willys-Overland Co., has returned $1,075,300 personal property for taxation. This is the largest personal tax return in Lucas County, Ohio.

227 New Members for S. A. E.

70 Full Members, 110 Associates, 21 Juniors and 26 Students Accepted by Council

WASHINGTON, D. C., May 15—The result of the special membership campaign of the Society of Automotive Engineers conducted during April was apparent at to-day's meeting of the council held in the offices of the society here in the Munsey Building, when 227 applications for membership were passed upon. Of these seventy entered into full membership, 110 into associate membership, twenty-one as juniors and twenty-six as enrolled students. Several concerns were received as affiliate members, these being Gemmer Mfg. Co., Detroit, Mich.; Timken-Detroit Axle Co., Detroit, Mich.; Sawyer-Massey Co., Ltd., Hamilton, Can.; and Gas Engine & Power Co.; and Chas. L. Seabury Co., New York City.

The full council was not present, those attending, in addition to President George W. Dunham, being Messrs. Bachman, Beecroft, Huff, Manly, Moskovics, Utz, Clarkson, and Chase.

The application of Walter C. Baker, Cleveland, Ohio, for life membership, was accepted.

Reorganize Chain Division

Much routine work was taken up in connection with standards and other matter. It was voted to reorganize the chain division of the standards committee. The resignation of A. L. McMurtry of the lighting division was accepted, and W. T. Jones, president of the Edmunds & Jones Mfg. Co., was appointed his successor. A. A. Gloetzner was assigned to the transmission division. Several subjects were assigned to the different divisions of the standards committee as follows: Trailer hitches, assigned to the truck standards division; tolerances and steel felloe bands to the tire and rim division; width of wood felloes and tolerances on same to the tire and rim division; sheet steel for aeronautic purposes to the iron and steel division.

The approval of the constitution of the recent tractor section of the society formed in Minneapolis was recorded.

The society is going to publish a roll of honor of its members, giving the names of those enlisted in the government service.

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London Bus Drivers Strike

LONDON, May 14—A strike has been declared by the 10,000 drivers and women conductors of the buses here. About 1200 buses have been removed from the streets. Only about thirty were running in the entire metropolitan area. The union demands a war bonus of $2.50 a week and the reinstatement of six men and four women recently dismissed.

Military Trucks Now Class A and B

Authorities at S. A. E. Request Change Designation of 1½ and 3-Ton Trucks

NEW YORK, May 15—The S. A. E. standards committee at the Cleveland meeting May 3 passed a resolution to the effect that the industry would appreciate a change in the naming of the two military trucks, and the War Department has now acceded to this request. In future the 1½-ton army truck will be known as military truck Class A, and the 3-ton will be called military truck Class B.

The object in asking for a change of this sort is that the trucks specified have to carry more than the nominal loads, and are in every way larger and heavier than 1½ and 3-ton trucks should be built for commercial service. Thus the removal of the capacity definition will be much appreciated by truck builders.

The truck standards division is still busy on details of the specifications which are being improved in detail, although not affected in any large way, by a general consideration by the S. A. E. and the War Department. A meeting of the division is scheduled to take place in Washington shortly, mainly for the purpose of discussing interchangeability of such parts as are called for in the specifications and are not regular commercial products.

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Coffin on Munitions Board

WASHINGTON, D. C., May 14—A general munitions board has been created by the Council of National Defense. H. E. Coffin has been named chairman of the industrial committee of this board.

—

644 Members in Buffalo Engineering Society—Officers Elected

BUFFALO, N. Y., May 10—The membership of the Engineering Society of Buffalo has now reached 644, a fact which was announced at a meeting last night held for the purpose of electing officers for the 1917-18 season, who will be as follows: President, F. A. Lidbury; vice-president, D. W. Sowers; secretary, F. B. Hubbard; treasurer, W. M. Dollar; directors, H. B. Alverson and F. E. Cardullo.

It will be remembered that this society is closely affiliated with the recently formed Buffalo Section of the Society of Automotive Engineers.

—

Detroit to Raise Truck Corps

DETROIT, May 14—Formation of Detroit's corps of the motor truck transport service of the United States army was planned yesterday at a meeting at the Detroit Athletic Club, and examination of applicants was made to-day at the Board of Commerce. The names of 1800 truckmen have been obtained from truck users. Of this number 450 have no dependents.

Captain William E. Dunn, of the United States Army, was present and explained that from 1500 to 2000 expert drivers would be required, and stated he had instructions to assist in the enlistment, authority for which is derived from General Thomas Barry, of the central department.

David Barcley, former truck master of the United States Army at the Mexican border, has offered his services in testing driving and mechanical ability. In addition to these tests, applicants must submit to a physical and mental examination.

—

Indianapolis Makers Guard Plants from Agitators

INDIANAPOLIS, May 13—Indianapolis automobile manufacturers are taking precautions to prevent agitators, who are said to be enemies of the Government, from gaining a foothold in their factories. In view of the distressing labor conditions now existing at Muncie, Ind., as a result of a machinists' strike involving 3000 men, no machinists from other cities are being employed unless their records are clear of connection with trouble-making organizations.

—

May Not Draft Skilled Mechanics

DETROIT, May 11—Word has been received from Washington that a special section will be left in the selective draft bill now being prepared by the Senate and House committees for the President's signature, which will exclude from field service those workmen who on account of their mechanical skill will be of greater value in the manufacture of aeroplanes, motor trucks and munitions of war.

—

Millinery Assn. Pledges 40 Ambulances

NEW YORK, May 11—Forty ambulances, completely equipped, have been pledged by members of the Eastern Millinery Assn. These cars are to be sent to France in two units of twenty cars each, and are to be designated as the American Ambulance Millinery Branch.

—

Flint Makers in Ambulance Work

FLINT, MICH., May 10—Organization and equipment of the motor ambulance unit will be undertaken by the Flint Manufacturers' Assn., according to an announcement to-day by J. D. Dort, chairman of the committee appointed for the purpose by C. S. Mott, president of the Flint chapter of the Red Cross. Dr. J. G. R. Manwaring, James S. Parker, H. H. Bassett and W. R. Hubbard are the other members of the committee.

—

Horace Dodge Gives Yacht

DETROIT, May 11—Horace E. Dodge, of Dodge Brothers, has given his steam yacht Nokomis I to the Navy Department. The yacht is said to be worth $250,000.

Standardize Truck Accessories

S. A. E. Committee Co-operates with Makers and Army on Military Truck Fittings

WASHINGTON, May 15—Several members of the Truck Standards Committee of the Society of Automotive Engineers met here yesterday with a dozen or more representatives of truck factories and representatives of the Quartermaster's Department, to take action in standardizing various so-called accessories that will be needed for the military trucks. The work centered around such matters as front and rear bumpers, towing hooks, seat arrangements, large gasoline tanks, magneto straps and couplings, radiator guards, and other matters with regard to dust collectors for the carbureters and generator mountings. The work consisted largely of finding out what can be done along these lines, and also in the representatives of the Quartermaster's Department laying before the manufacturers what it considered necessary in this work.

The department submitted general drawings showing the scheme of seat for military trucks, which accommodated beneath it the 30-gal. gasoline tank, as well as the tray for holding the battery. The seat accommodates four persons.

Towing hooks will be required for four-wheel drive trucks, which, it is understood, are the only ones that will draw trailers. The ordnance type of towing hook has been agreed upon.

For two-wheel drive trucks the front bumper is to be a heavy channel section backed up by springs. The rear bumper is a large ash or oak piece 56 in. long and of 3 by 8 in. section.

The 30-gal. gasoline tank is made with two reserve compartments of 6 gal. each. A three-way drain allows of using one and then the other of these reserves. The drain cap always insures one of the reserves being in use, even if through carelessness the other one might not be.

A standard type of magneto strap for holding the magneto on its seat was agreed upon, as also was a form of magneto coupling. While these two cannot be looked upon as standards, it is understood they will be preferred on all military trucks.

The radiator guard is the European design, similar to that furnished by several of our truck makers who have been furnishing European governments with military vehicles. It is a substantial prison-bar grating type.

The truck manufacturers present agreed to co-operate on the matter of generator mounting, and also on the problem of securing a satisfactory dust collector for the carbureters. Nothing specific in either matter apparently was submitted and Captain Britton, of the Quartermaster's Department, expects that, through the co-operative work of the truck makers, some possible style to be preferred will be developed.

Fight Postal Rate Increase

Business Publishers Urge Taxing Profits—Higher Rates Would Affect Subscribers

WASHINGTON, May 18—Increasing the postal rates on second-class mail matter, such as THE AUTOMOBILE from 1 cent per pound to an average of 4 cents per pound, an increase of over 400 per cent, resulted in the business publishers, magazine publishers, and daily papers congregating in this city for several days past. They have laid their objections to the increased rates on second-class mails as drafted by the Ways and Means Committee, before the Senate Finance Committee, which has the matter in charge. There were hundreds of magazines representing the industries of the country, as well as farm papers, general magazines, etc.

The result of the hearings before the Senate Finance Committee, which were attended by over 100 of the largest men in the publishing industry in the country, was that an increase of 400 per cent in second-class rates would more than consume the profits of scores of papers. During the past year, publications have not been profiting from war stimulation, but rather suffering because of the increased rate of print paper. If to this increased paper cost is added a 400 per cent postal increase the publications of the country will be injured in an inconceivable way, not to mention those that will be entirely eliminated from the field.

Earnings Submitted

The business publishers, as well as the magazine and daily paper publishers, realizing the seriousness of the situation, frankly laid before the Senate Finance Committee statements of profits extending over a period of years, which was conclusive proof that they simply could not stand a 400 per cent increase in postal rates on top of print paper.

The most serious aspect of the proposed postal increase is dividing the country into the zone system, that is, eight zones to the country, and charging a heavier postage rate for more remote zones. These zones correspond with the parcel post service, and vary with the different cities. As New York is a publishing center, the zones are:

Zone	Miles Radius from Mailing Point	Cents Per Lb. Postage
1	50	2
2 and 3	50-300	3
4 and 5	300-1000	4
6 and 7	1000-1800	5
8	Over 1800	6

This zone system would mean that California and in fact everyone west of the Mississippi River, would have to pay much heavier subscription prices than States in the East and Central sections. With many publications, the subscription rate to California would not equal the cost of mailing. The zone system would tend to upset the national spirit of the business papers of the country. An industry such as the automobile industry is national, and publications serving it, such as THE AUTOMOBILE are national in character. The zone system is a direct attack at this national characteristic. The zone system would aim at making national papers like *Iron Age* in the metal field, a local paper, that is, to a local section of the country. Such would prove a great injury, not only to the paper, but to the metal industry. The same would apply to business papers in other industries, such as, *Electrical World* in the electrical industry; *Motor World* in the automobile merchandising field, etc. Each of these papers represents a national industry and serves these industries as a part of them. The message that one automobile factory has for its dealers goes to all parts of the country. It is a national message. If you adopt a zone system, you undermine this national aspect of publications; you aim at impairing the national spirit of the country, and you correspondingly destroy the national spirit of the industries.

The labor and printing organizations in the publishing field are strongly opposed to the zone system in that it would naturally mean that certain publications now printed in New York, and other Eastern places, would have to move to central locations. Big printing houses could not move their equipment. The labor connected with the industry could not be moved.

Tax Profits, Urge Publishers

The publishing industry has no objection to paying its due share of war taxation in the form of excess profits and higher income rates, but it does object to being singled out and made the victim of a 400 per cent tax that would practically stop the wheels of the industry.

The business papers have stood by the Government and are prepared to stand by it in the present crisis. On the declaration of war they offered free advertising space to the Government. To-day the Government is depending on the publications of the country to carry its educational messages to the industries as well as to the people, yet the tax would practically destroy the tools by which the publishing industry is co-operating with the Government.

The Government has been contending that in recent years it has been carrying second-class mails at a great loss, but no definite figures can be obtained to show this. The figures generally cited are those based on investigations made 10 years ago.

Should the present 400 per cent increase go into effect the majority of the publishers will have to pass the increase on to the subscribers. The enormous increase in cost of print paper, plus the tax, makes this imperative. Should the zone system go through it is more than probable that subscribers in remote zones will have to pay twice as much for their paper as those located nearer the center of publication. This means placing a tax on education, which never has been considered correct. The Government through its various departments, admits that the business papers are institutions and necessary parts of industries. They are as essential to industries as many of the components such as factories, societies and organizations. For this reason they should not be taxed out of existence. The business papers are the educational tools that nationalize the American industries, and nationalizing the American industries will be the great factors in deciding this war. It is only in the business journals of national circulation that you can find industrial and engineering questions discussed from the broad point of view of the nation's interest without regard to the interest of any particular locality.

Could it be considered a step toward making our industries more efficient if we were to destroy their national factories and require them to erect small factories in different sections of the country? This is what the zone system would compel many national publications to do.

This zone system should be combated by every subscriber of every business paper in every State in the Union. Those in California, the Rocky Mountain sections, subscribing for automobile, electrical, machinery, metal, hardware, drygoods, cement and every other type of national publication will have to pay a huge burden for the information which they should be getting at the same price as those in other States. There is no justice in a zone system that puts a tax on educational information going to one section of the country as compared with another section.

Subscribers Affected

Subscribers of business papers, as well as readers of general magazines, must realize that this fight against a 400 per cent postal increase under the zone system is a direct burden being placed on them. It is a burden that the publishers will have to pass on to them. They cannot continue in business otherwise. These subscribers should take the matter up with their Washington Congressman, but preferably with the Senators. The taxation bill drafted by the Ways and Means Committee is now before the Senate Finance Committee. This committee has been holding hearings on it from the different industries. It is expected that many modifications will be made in the bill, so that certain industries will not be singled out and loaded with unjust taxation, while others go free. From the Senate Finance Committee, the bill will go before the Senate.

Subscribers to THE AUTOMOBILE *are asked to write their Senator or see him personally to protest against this discriminating second-class postal tax. Personal visits are best, but if they are impossible, letters and telegrams will serve.*

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Collins Interested in Castings Company

DETROIT, May 14—B. W. Collins, whose resignation as sales manager of the Parker Rust Proof Co. was recently announced in THE AUTOMOBILE, has purchased an interest in the Marshall Castings Co., of Marshall, Mich., manufacturers of manifolds and exhaust pipes.

Personals

DETROIT, May 14—D. McCall White, chief engineer of the Cadillac Motor Car Co., has resigned. No announcement has been made as yet regarding his successor. It has been reported that Mr. White has designed an aeroplane engine in which the Government is interested, and that this is the cause for his resignation. Mr. White was chief engineer of the Napier Motor Car Co. of England prior to his connection with the Cadillac company. For the past year he has been chairman of the Detroit section of the Society of Automotive Engineers, and he is a director of the Aero Club of Michigan.

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CLEVELAND, May 10—J. F. Keyes has been appointed engineer for the Standard Parts Co. Mr. Keyes was formerly experimental engineer of the Cadillac Motor Car Co.

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CHICAGO, May 14—John Whyte has been appointed chief engineer of the Bailey Non-Stall Differential Corp. Mr. Whyte was formerly with the Prest-O-Lite Co., Indianapolis, where he was engineer of the battery service.

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KOKOMO, IND., May 14—S. M. How has become general sales manager of the Haynes Automobile Co. He was eastern sales representative and has been with the company for 8 years. H. W. Prine, formerly of the Pathfinder company, will succeed him as sales representative.

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ALMA, MICH., May 14—C. McElfresh is now in charge of the motor department of the Republic Motor Truck Co. He was formerly production manager at the Muskegon plant of the Continental Motors Corp.

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DETROIT, May 14—L. W. Swords has been appointed general field sales supervisor, director and vice-president of the Wallace C. Hood Service Bureau. Mr. Swords was formerly factory representative for the Maxwell Motor Co.

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WALTHAM, MASS., May 11—The Metz Co. has made a number of changes and promotions in its sales organization. Edwin Metz, who has been retail sales manager for this district, was promoted to assistant to the president of the company, his father, C. H. Metz. E. L. Bunker, Maine manager for the Metz, will head the local sales, with C. I. Pickens, son of general sales manager R. A. Pickens, as office manager of the retail branch.

The Maine territory will henceforth be in charge of A. S. Rowe, who comes from the managership of the western Pennsylvania district. J. V. Gormley, state manager of Georgia, has been recalled to the factory and will be connected with the local retail branch. J. B. Ramm, formerly at Birmingham, Ala., as state manager for that district, will handle both Georgia and Alabama in the future.

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DETROIT, May 16—R. F. Anderson will become body engineer of the Hayes-Ionia Co., Ionia, Mich. He was formerly in the body engineering department of the Packard Motor Car Co.

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DETROIT, May 11—W. D. Bell has been appointed superintendent of employment for the Parker Rust-Proof Co. of America.

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DETROIT, May 12—Frank M. Langdon, assistant advertising manager of the Cadillac Motor Car Co., has reported at Fort Sheridan, Ill., for training in the officers' corps.

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DETROIT, May 12—W. O. Briggs, president of the Briggs Mfg. Co., has enlisted in the United States army and will serve in the special service department.

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DETROIT, May 12—H. Russell Brand has been appointed business engineer of the Springfield Body Corp.

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DETROIT, May 14—W. H. Taneyhill has been promoted from manager of the central district to assistant general sales manager of the Scripps-Booth Corp.

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DETROIT, May 14—C. L. Miller has become secretary of the Detroit Executive Club. Mr. Miller was formerly assistant production manager at the Detroit plant of the Continental Motors Corp.

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AKRON, May 10—The Goodyear Tire & Rubber Co. has made the following promotions:

C. M. McCreery, formerly assistant manager of the Chicago district, is now special manufacturers' representative for that district. W. S. Boone, formerly supervisor of city sales in Philadelphia, is now special manufacturers' representative for the New York district. G. H. Barmore has been transferred from branch manager at Milwaukee, Wis., to assistant manager of the Chicago district. A. J. Sears, formerly branch manager at Sioux City, Iowa, succeeds Mr. Barmore as branch manager at Milwaukee. W. A. Ziegler has been promoted from city salesman at Milwaukee to branch manager at Sioux City, Iowa.

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FREEPORT, ILL., May 11—Changes have been made as follows among heads of departments of the Stephens Motor Car Co.: H. C. Dunning, assistant manager, has resigned, and has been succeeded by C. B. McCool. L. J. Dudley, who has been superintendent of the body plant, has been promoted to general superintendent of the company. H. B. Bell, who has been manager of the service department, has resigned to enter the army, and has been succeeded by E. H. Snavely, formerly purchasing agent. O. T. Lawson has been appointed purchasing agent, with H. A. Story as assistant.

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INDIANAPOLIS, May 11—J. G. Murphy, who for the past 11 years has been connected with the Pierce-Arrow Motor Car Co., Buffalo, has been appointed superintendent of the Pathfinder Co.

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NEW YORK, May 10—J. B. Clarkson, one of the leading importers of automobiles and accessories in Wellington, New Zealand, will be in this city May 19. Mr. Clarkson is with Messrs. Hope, Gibbons Sons & J. B. Clarkson, Ltd.

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DETROIT, May 15—Walter E. Parker, president of the Commerce Motor Car Co., returned last night from an extended trip to China, Japan and other points in the Far East.

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NIAGARA FALLS, N. Y., May 11—C. L. Lane, formerly secretary of the United States Lighting & Heating Corp., is now vice-president and general manager succeeding A. H. Ackerman, resigned.

J. A. White, formerly Chicago branch manager, is now sales manager of the battery division, succeeding C. C. Bradford, resigned.

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NEW YORK, May 15—J. C. Gorey and Co., has taken the Eastern agency of the Warner Gear Co. By special arrangement with this company, stock will be carried after June 1, including standard transmissions, control sets, clutches and steering gears for immediate delivery.

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CHICAGO, May 14—J. R. Brooking, formerly with the Studebaker in the Northwest, has been made district manager for the Bailey Non-Stall Differential Corp., Chicago. He will cover Chicago, Minneapolis and St. Louis territory. Eugene R. Johnston has been made manager in Kansas City territory. He formerly was with Maxwell in New England. J. B. Schroeder has been made district manager in Michigan, Ohio and Indiana. He was formerly with the Miller and Thermoid rubber companies. John Whyte has been made chief engineer. He was formerly with the Prest-O-Lite Co.

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CHICAGO, April 29—Production and sales departments of the Diamond T Motor Car Co. are now well organized. G. A. Gibson, formerly with the Packard company, has complete charge of the entire production, and is assisted by P. W. Herman, assembly superintendent. W. F. Bird has charge of the fin-

ishing department; Carl Burton has entire charge of the material, and F. Lundgren is superintendent of the machine shop. D. W. Jones is chief engineer and H. C. Emberson is chief purchasing agent.

The sales force has been entirely reorganized, with F. J. Pardee at its head. J. S. Conroy has been appointed district sales manager. J. P. Burris, just resigned from the Packard company, will take charge of all national business. R. E. Breeden is special territory man for appointing distributers.

The new plant is being completed, the first buildings covering about 125,000 sq. ft. of the 10 acres owned by the company.

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CHICAGO, May 11—M. A. Smith, mechanical engineer Standard Oil Co. of Indiana, who has been reserve officer in the infantry, has become first lieutenant in the Marine Corps, taking active service on the first day of the war.

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DETROIT, May 15—A. N. Goodfellow has been appointed western sales manager of the Standard Roller Bearing Co. with headquarters in this city.

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ST. LOUIS, May 15—C. A. Oldham, formerly resident manager of the United States Tire Co., Kansas City, has been made district manager for the company here. Mr. Oldham succeeds H. H. Hubbard, who has been placed in charge of special work for the company.

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DETROIT, May 14—M. L. Alfont has become superintendent of the factory of the Jones Motor Car Co., Wichita, Kan.

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NEW YORK, May 10—Robert H. Patchin has resigned as secretary of the National Foreign Trade Council to become affiliated with W. R. Grace & Co. O. K. Davis succeeds him.

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ATLANTA, GA., May 12—R. J. Murphy has resigned from the B. F. Goodrich Rubber Co. to enter the automobile business as wholesale distributor. J. R. Cheshire will become his successor. Murphy has been with the Goodrich company for the past 14 years, his last position being Southern manager in this city.

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INDIANAPOLIS, May 16—J. H. McConnell has taken charge of the sales department of the Shotwell Pump & Tank Co. He was formerly with the S. F. Bowser Co. and later with the Wayne company.

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CHICAGO, May 11—W. G. Gernandt, formerly motor engineer with the Amalgamated Machinery Corp., has opened an office as consulting automobile engineer in Chicago.

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MILWAUKEE, May 15—E. W. Jordan has resigned as chief of the plan and copy departments of the Cramer-Krasselt Co., and has joined the Bigelow-Waggoner Co., advertising agents, Indianapolis, in the capacity of vice-president, in charge of plan and copy departments. Mr. Jordan was at one time in charge of the Warner Instrument Co. advertising and later with the Curtis company in Detroit.

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ELECTIONS

MARSHALL, MICH., May 8—Following the resignation of officers and directors of the All-Season Body Co., as was reported in a recent issue of THE AUTOMOBILE, new officials have been elected as follows: F. Raymond Bothwell of Jackson, Mich., accountant for the Briscoe Motor Corp., has been elected secretary; J. A. McAvoy, vice-president, has also assumed the duties of treasurer. Other officials have not yet been elected. The company is increasing its production to have a capacity of twenty-five bodies a day within 2 months, at the end of which time plans will be formulated to increase this to fifty bodies a day. When the company reaches the production of fifty bodies a day it will be earning $500 a day, net profit.

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NEW YORK, May 11—H. B. Mingle has resigned as president of the Aircraft Manufacturers Assn. The following were elected at the regular monthly meeting: President, F. H. Russell, of the Burgess Co., Marblehead, Mass.; vice-president, A. H. Flint, of the L-W-F Engineering Co., College Point, L. I.; treasurer, I. M. Uppercu, Aeromarine Plane & Motor Co., New York; secretary, B. L. Williams, and assistant treasurer, A. H. Flint.

Six committees were authorized as follows: Advisory, A. H. Flint, H. B. Morse, Benjamin Foss; patents, Curtiss Aeroplane & Motor Corp., Thomas-Morse Aircraft Co. and Sturtevant Aeroplane Co.; materials, L-W-F Engineering Co., chairman, Curtiss Aeroplane & Motor Corp., Burgess Co., Standard Aero Corp., Sturtevant Aeroplane Co., Thomas-Morse Aircraft Co.; membership, Benjamin Foss, H. B. Mingle and A. H. Flint; standardization, Curtiss Aeroplane & Motor Corp., chairman, L-W-F Engineering Co., Burgess Co., Standard Aero Corp., Sturtevant Aeroplane Co., Aeromarine Plane & Motor Co., Thomas-Morse Aircraft Co. and B. F. Sturtevant Co., and publicity, advertising and censorship, F. L. Faurote.

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HARTVILLE, OHIO, May 14—The Be Saw Tire & Rubber Co., which recently increased its capital stock to $1,000,000 to build factory additions, has elected the following officers: President, Charles A. Be Saw; vice-president, I. M. Putnam, and secretary-treasurer, D. W. Be Saw.

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CLEVELAND, OHIO, May 14—Alfred Thompson has been elected president and general manager of the Abbott Corp. of Cleveland, succeeding Guy W. Morgan, whose resignation was recently announced in THE AUTOMOBILE. Mr. Thompson was at one time manager of the Pope-Toledo Co., later manager of the plant of the Rutenber Motor Co., following which he was production manager for the Maxwell Motor Co., Inc. Lately he has been the production manager of the Hudson Motor Car Co.

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FOSTORIA, OHIO, May 14—The Fostoria Press Steel Co., which recently incorporated at $100,000 to make all pressed steel parts for the Allen Motor Co., has elected the following officers: President, Henry Rothrock; vice-president, G. E. Kirk; secretary, E. C. Wolfe, and treasurer and general manager, C. D. Pifer.

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AKRON, May 14—Maurice Cryder, who won the Goodyear Tire & Rubber Co. fellowship, and H. A. Smith, who won the Firestone Tire & Rubber Co. fellowship, have been selected for fellowships offered rubber chemistry by Akron University.

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NEW YORK, May 11—John F. Alvord has been elected president of the Wright-Martin Aircraft Corp. Mr. Alvord is at present president of the Hendee Mfg. Co., and it is understood that he is to retain that position in the future, as well as serving as president of the Wright-Martin Co.

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OBITUARY

NEW YORK, May 12—G. N. Thurber, vice-president of the Isotta-Fraschini Motors Co., died Sunday at the age of 31. He began as expert agent for an American firm with headquarters in Paris; later he was associated with Smith & Mabley, Chicago, distributor of the Simplex, Renault and various other high-grade cars; then he was sales manager for Quinby & Co., body builder, later taking charge of its New York showroom and selling the Isotta. Finally he took the agency for the Isotta, forming the company of which he was vice-president. The company also handles the Scripps-Booth. He was also president of the T. V. T. Motors Corp., Washington, distributor of the Scripps-Booth and Marmon.

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KALAMAZOO, MICH., May 14—Maurice E. Blood, identified with the construction of motor cars and parts since 1900, died at his home here last week. He was 66 years old. In 1900 he left the bicycle business to become manager of the Michigan Automobile Co., and in that year and the year following 150 narrow-tread cars were constructed. In 1902 he united with his brother in the organization of Blood Bros. Machine Company, then of Kalamazoo, and now of Allegan, Mich. In 1903 he invented the universal joint which is now being manufactured in practically the original form.

Blood Bros. Machine Company, under the management of the late Maurice E. Blood, increased its capitalization from $500 to $75,000 in eleven years of business without a single call for outside capital. He is survived by the widow and two sons, Howard E. Blood of Detroit and Wallace B. Blood of the *Motor Age* staff.

Factory Activities

NEW YORK, May 14—The Duesenberg Motors Corp. has filed plans for the construction of a plant in Elizabeth, N. J., for the manufacture of aeroplane engines for the Government. The plant will be in Newark Avenue and will cost $20,000. The company has been forced to seek larger quarters. It has been occupying a plant at Edgewater temporarily.

It is believed that the new plant will be the largest in the East, being one story, and employing more than 1000 men. The company has bought 9½ acres of land in Elizabeth.

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CLINTONVILLE, WIS., May 12—The Four Wheel Tractor Co. of Wisconsin, organized some time ago by capital at Antigo, Appleton, Clintonville, Wausau and other northern Wisconsin cities, has definitely selected Clintonville as the permanent site of its factory and headquarters.

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BEAVER DAM, WIS., May 12—The Western Malleables Co., which added a line of automobile castings to its regular output of railroad material, has undertaken a number of important alterations and improvements in its three large foundry and machine shop units at Beaver Dam, to gain greater efficiency and consequently an increased output with existing facilities. The company reports that it is from 200 to 300 men short in all departments, due to the keen competition for skilled and unskilled foundry and machine shop labor among all metal-working centers of the entire country.

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GRAND RAPIDS, MICH., May 15—The Higrade Motors Co., which was organized early this year, as was announced in a past issue of THE AUTOMOBILE, will soon commence steady production of its Higrade trucks. The company has purchased a tract of land in this city and will erect a factory to be completed early in September, but arrangements are being made for putting the first trucks on the market about July 20. The first thousand trucks will be made in the experimental shops at Harbor Springs, Mich. The company is manufacturing a ½-ton truck. The chassis weighs 2310 lb., and with the heavy express body and full top the weight is approximately 2800 lb. The equipment includes, standard 32 by 4 tires. The wheelbase is 115 in., with 102 by 48 floorspace clear of the driver's seat. The wagon bed floor is 30 in. from the ground. The engine is a Wisconsin 3¼ by 5 four-cylinder truck motor equipped with a Bosch high-tension ignition, lighting and starting outfit. Sheldon worm drive axles and spring suspension, Spicer direct drive; Borg & Beck disk clutch; Lavine semi-irreversible worm steering gear; Fedder cellular radiator; Parish frame members constitute the most important units. The car has a turning radius of 22 ft. The price, which has not yet been settled upon, will be under $1,600.

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DETROIT, May 15—Two real estate transfers involving $58,000 of property near Windsor, Ont., were made Saturday when Gordon McGregor, managing director and Wallace Campbell, secretary-treasurer of the Canadian Ford Motor Co. purchased the land. No announcement is made at this time but it is thought that this property may be used for factory purposes for the Canadian Ford company.

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BOUND BROOK, N. J., May 14—The Bound Brook Oil-Less Bearing Co. will build a foundry at plant 2, Lincoln, N. J. The new addition will be of steel and brick construction, 60 by 180 ft., and two stories. It will be completed by Aug. 1.

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CLINTONVILLE, WIS., May 12—The Four Wheel Drive Auto Co. will build another large addition to the plant at once, because of the demands imposed upon the existing facilities by the requirements of the war departments of the United States and European countries. The addition will be 100 by 180 ft., one story, with sawtooth roof, and will be a duplicate of the addition completed within the last 6 weeks. The F. W. D. truck factory has been increased in size from 300 to 400 per cent within 18 months.

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SHEBOYGAN, WIS., May 12—The Wald Mfg. Co., which makes a varied line of automobile specialties, has awarded contracts for the erection of a one-story factory addition, 60 by 100 ft., which will enable it to increase its capacity about 50 per cent within the next 60 days.

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BATAVIA, ILL., May 11—The Curtis Form-A-Tractor Co., Chicago, will remove its plant to this city. One hundred men will be put to work at the outset. The Benson Engineering Works will be utilized for the plant. It will require 6600 ft. of floor space at the beginning, and this will be increased.

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TRENTON, N. J., May 11—The De Lion Tire & Rubber Co. is having plans prepared for a second-story addition to its plant, 50 by 112 ft., to cost about $10,000, and for a new reinforced-concrete extension, 20 by 60 ft., to cost $7,000.

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STAMFORD, CONN., May 14—The Amco Motors Co., maker of engines, has moved from the Loth mill in Norwalk to the John Davenport foundry in this city. The two companies were recently merged under the title Springfield Motors Co.

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NEWARK, N. J., May 12—The Overland Tire Co., recently incorporated with a capital of $100,000, has acquired property at 15-25 River Street, for a plant for the manufacture of tires. The initial operations will include a floorspace of about 40,000 sq. ft. J. A. Whitman of Grantwood, N. J., is president.

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ASHTABULA, OHIO, May 11—The Sav-A-Live Fender Co., Cleveland, will occupy the building of the Worsted Mills Co. The Sav-A-Live Co. manufactures a steering wheel and other automobile specialties. The company will erect a foundry building on the premises.

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PHILADELPHIA, May 14—The Philadelphia Storage Battery Co. has completed a new factory which doubles its capacity. It is considering possible extensions of its business.

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DETROIT, May 12—The Covert Gear Co. of Lockport, N. Y., will erect a factory in Detroit which will double the output of the Lockport plant.

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ARGO, ILL., May 12—The Elgin Motor Corp. will build a one-story addition, 74 by 240 ft., costing $40,000.

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DETROIT, May 11—The Parsons Mfg. Co., manufacturer of automobile body hardware, has leased a new factory at Stanley and Vermont Avenues, where the present capacity will be tripled. The new additional equipment will be installed and in operation by June 1.

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PRODUCTION

DETROIT, May 12—The Maxwell Motor Co. is at present shipping trucks at the rate of about ten a day. This production will be speeded up as soon as additional equipment can be secured.

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TOLEDO, May 14—The Willys-Overland Co. has driven 4103 cars from its plant so far this year. In January 903 cars were driven away, in February 1058, and in March 2142.

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ALMA, MICH., May 14—Production of the Republic Motor Truck Co. is now at the rate of one truck every 7 minutes, or eighty-six trucks per day.

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FLINT, MICH., May 14—The Champion Ignition Co. has completed arrangements to increase its output to 80,000 A. C. spark plugs daily. Other plant additions will later be made to increase this output.

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WALKERVILLE, ONT., May 14—The Chalmers Motor Co. of Canada has shipped its first carload of cars, consisting of ninety automobiles, for Montreal.

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SYRACUSE, N. Y., May 10—The Franklin Automobile Co. shipped 143 per cent more cars in the 6 months ending May 1, 1916, than it did in the previous 6 months.

Little Change in Materials

Supply in Uncertain Condition—Increase in Shipping May Make Matters Worse

NEW YORK, May 17—Substantially there is little change in the raw material situation to be recorded this week. It would be hard to find a time in history when the supply of raw material to any industry was in as uncertain a state as that which prevails in the automobile industry at present. One fundamental fact stands out clearly, and this is that the demand for steel exceeds the supply and is likely to exceed it for a long time to come. This can mean only one thing, namely that what is called for by the Government either for American use or for export will have to be supplied first and industries not regarded officially as essential will have to compete for the surplus.

The immediate effect on the automobile industry may easily be a curtailment in the production of passenger cars, some of the material being diverted to the making of trucks and tractors, aviation engines and even boat motors. If partial government control of the steel output does come the makers of trucks and tractors are likely to be favored at the expense of the makers of passenger cars alone.

Steel overshadows everything else just now. While in normal times fluctuations in prices are indicative of conditions, it is not prices in the future which count now so much as whether the materials will be procurable at any price whatever. To predict that a general rise in almost everything is probable does not require any very deep foresight.

Increase in shipping facilities, which is assured by the end of the year at the latest, is likely to make matters worse for the American manufacturer in one way, though it will permit the export of many manufactured goods which cannot now be sent abroad. Probably with increase in shipping there will be more increase in export of manufactured goods than in raw materials, so the balance will favor American producers, but the prices for materials will rise with every ton sent abroad.

One rumor which can be classed as absurd, thus removing a cause for panic, is that practically all the steel of the country is to be put into ships. The consumption of steel for ship building is limited by the shipyards available and the plate mill capacity, and, while ship building could be accelerated considerably, there is a limit that is far below the absorption point for all the steel being made.

Just at the moment the tin plate industry is the most involved, but this has only a small effect upon automobile manufacture.

Spelter has grown stronger and the market is in a better position to maintain itself since an agreement has been reached with the Council of National Defense as to quantity and price. The requirements specify three grades, A, B and C. Of A grade the specification calls for 6703¾ tons, for B 3440½ tons, and for C 225 tons, in all 10,369¼ tons.

The Council of National Defense, through its alloy committee, is doing its best to fcailitate the supply of manganese, which has been falling off lately, and it is expected that larger shipments will be forthcoming shortly, in consequence of which there has been a decline in price around $25 per ton.

All probability of a strike of more than 45,000 bituminous coal miners in the Central Pennsylvania field has been ended by announcement of a 25 per cent increase in wages. The struggle for coal is as keen as ever, the demand from consuming interest being never as urgent as now. There has been another well defined upward swing to the bituminous market. Government requisitions have become heavy. Rumors have it that preparations are under way to give preferential movement to government coal.

The cotton consumption continues to rise and prices are correspondingly higher. Since the war began long staple American cotton has risen 150 per cent and Sea Island and Egyptians 220 per cent. It was reported this week that a lot of extra choice Sea Island cotton had sold at 73 cents a pound. Sea Island houses in the South have in some cases stopped forwarding their regular circulars to American correspondents. The situation is the same on Sakellaridis Egyptian cotton. The British embargo on shipments of Egyptian cotton in British bottoms has pretty effectively cut off the supply of this cotton, and spot lots are about exhausted, so that prices are nominal.

Daily Market Reports for the Past Week

Material	Tues.	Wed.	Thurs.	Fri.	Sat.	Mon.	Week's Changes
Aluminum, lb.	.59	.59	.59	.59	.59	.60	+ .01
Antimony, lb.	.24	.24	.22½	.22½	.22½	.25	+ .01
Bessemer Steel, ton	80.00	80.00	80.00	80.00	80.00	80.00	...
Copper, Elec., lb	.32	.32	.32	.32	.32	.32	...
Copper, Lake, lb.	.31½	.31½	.32	.32	.32	.32	+ .00½
Cottonseed Oil, bbl.	16.15	16.10	16.20	16.25	16.10	16.40	+ .25
Fish Oil, Menhaden, Brown, gal.	.80	.80	.80	.80	.80	.80	...
Gasoline, Auto, bbl.	.24	.24	.24	.24	.24	.24	...
Lard Oil, prime, gal.	1.85	1.85	1.85	1.85	1.85	1.85	...
Lead, 100 lb.	9.50	9.50	9.50	9.50	9.50	9.50	...
Linseed Oil, gal.	1.22	1.27	1.27	1.27	1.27	1.27	+ .05
Open-Hearth Steel, ton	80.00	80.00	80.00	80.00	80.00	80.00	...
Petroleum, bbl., Kans., crude	1.70	1.70	1.70	1.70	1.70	1.70	...
Petroleum, bbl., Pa., crude	3.10	3.10	3.10	3.10	3.10	3.10	...
Rapeseed Oil, refined, gal.	1.35	1.35	1.35	1.40	1.40	1.40	+ .05
Rubber, Fine Up-River, Para, lb.	.75	.78	.76	.76	.76	.76	+ .01
Rubber, Ceylon, First Latex Crepe, lb.	.84	.84	.84	.84½	.84½	.84½	+ .00½
Sulphuric Acid, 60 Baume, gal.	1.50	1.50	1.50	1.50	1.50	1.50	...
Tin, 100 lb.	59.00	63.50	64.50	65.00	65.00	65.00	+6.00
Tire Scrap, lb.	.06½	.06½	.06½	.06½	.06½	.06½	...

PRICE CHANGES

Name and Model	Old Price	New Price	Effective
Dixie, 5-Pas. Tour.	$845	$895	June 1
Dixie, 4-Pas. Rdster.	845	895	June 1
Dixie, 5-Pas. Con. Sedan.	1,275	1,295	June 1
Dorris truck, 2-Ton	2,185	2,285	June 1
King EE, Tour.	1,585	1,650	
King EE, Foursome.	1,585	1,700	
King EE, Sedan.	2,150	2,300	

NEW YORK, May 14—Prices on Carspring tires manufactured by the New Jersey Car Spring & Rubber Co., Jersey City, N. J., have gone up from 5 to 10 per cent, and not to 40 per cent as stated in THE AUTOMOBILE of May 10. The 36 by 4½-in. size has gone up from $44.95 to $49.50, and not from $35.40 to $49.50.

Ford Price Increase Near

DETROIT, May 15—The Ford Motor Co. is notifying its dealers that an advance in price may be necessary in the near future. Unfilled orders now on books amount to $100,000, and these will be filled at prevailing prices, but dealers have been notified that all orders from this time on are subject to an advance in price, and that delivery to consumers must be subject to price advance. Increase may be necessary some time in the near future because of the rapidly increasing price of materials, and this step is necessary for the protection of future Ford business.

Joins Officers' Reserve Corps

DETROIT, May 15—Lawrence Moore, vice-president of the Detroit Weatherproof Body Co. has joined the officers' reserve corps at Fort Sheridan, Ill. He temporarily relinquishes his duties until the close of the war.

$15,000,000 Tractor Order

DAYTON, OHIO, May 14—The Davis Sewing Machine Co. has received a large tractor contract from the C. L. Best Gas Tractor Co., San Leandro, Cal. The contract is for agricultural tractors ranging

from 20 to 40 hp. The minimum amount stipulated in the contract is $15,000,000.

The minimum number of tractors to be furnished annually by the Davis plant is 1800 and the contract extends over a period of years.

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NEW YORK, May 14—Estera-Ruiz & Co., 10 Broadway, has taken the agency for Kissel cars and trucks in Mexico. A special carload was shipped this week to Mexico City.

—

NEW COMPANIES

BUCHANAN, MICH., May 14—The Campbell Transmission Co. has been organized and is now erecting a factory which will cover 15,000 sq. ft. and cost $25,000. When completed $50,000 worth of machinery will be installed. Officers are L. L. Campbell, president; L. J. Campbell, vice-president and chief engineer, both of Buchanan, and C. B. Heineman, Chicago, secretary.

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DETROIT, May 14—The Quickwork Co. has been organized to take over and operate the machinery business of H. Collier Smith of Detroit. This business includes the manufacture of machinery for working plate and sheet metal for automobile parts. Mr. Smith retains the controlling interest and will have active charge of the operations of the company, which is capitalized at $400,000. Officers include: H. Collier Smith, president and general manager; H. E. Groves, vice-president; A. F. Smith, secretary and treasurer; W. J. O'Leary, production manager; W. W. Prigg, director of sales, and Harry G. Smith, engineer.

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DETROIT, May 14—The Oliver Auto Device, Inc., has been organized with a capital of $100,000 to manufacture new automobile novelties. Incorporators include William E. Metzger, D. S. Oliver and H. H. Crawford.

The Auto Trimming Co. has been incorporated in Detroit for $1,000.

—

SANDUSKY, MICH., May 15—A company has been organized in this city to manufacture tractors known as the Michigan Tractor Co.

—

YPSILANTI, MICH., May 11—The Michigan Crown Fender Co. has been incorporated at Ypsilanti for $200,000.

—

SAGINAW, MICH., May 9—The Saginaw Auto Body Co., with a $100,000 capital, has been formed here by S. L. Eastman, L. F. Lampke and J. W. Vipont. The company has $57,500 subscribed of which $32,450 has been paid in.

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DETROIT, May 16—The Super Six Racing Co. has been formed, with a capital of $1,000. The incorporators are A. J. Hill, W. H. Chandler and E. A. Shelbreak.

—

Olympian Gets 1150 Export Order

PONTIAC, MICH., May 17—The Olympian Motors Co. has contracted with Armstrong & Dessau, New York, for 1150 cars for export.

Supreme Motors Co. Formed

$1,000,000 Concern Will Make Four, Six and Twelve-Cylinder Engines

CLEVELAND, May 14—The Supreme Motors Corp. has been incorporated at $1,000,000 to manufacture three types of engines, a twin-six, a six and a four. The experimental work has been carried on by the Davies-Mitchell Engineering Co., this city, which has been absorbed by the Supreme Motors Corp. Courtney N. Mitchell is the designer; B. J. Cline, formerly with the Chandler and the Elgin, has been made production manager. Experimental work is in charge of C. E. Manning, for 3 years with the Continental Motor Co. The four-cylinder motor is adapted for truck and tractor work, while the others are designed for passenger cars. The officers are: President and general manager, C. F. Jamison, formerly with the Saxon and Elgin; vice-president and treasurer, Charles H. Davies, organizer of the company; vice-president and director of manufacturing, B. J. Cline; secretary, William J. Lavery; director of engineering and purchasing, C. N. Mitchell; assistant chief engineer, C. E. Manning.

—

Packard Aeroplane Engine Nears Completion

DETROIT, May 15—A variety of stories regarding the aeroplane activities of the Packard Motor Car Co. have been circulated, the latest being on a supposed high-speed plane that the Packard company was said to intend building. THE AUTOMOBILE is able to state authoritatively that the Packard Motor Car Co. has given up the idea of making planes, as it is going to turn its entire attention in this department to the manufacture of aeroplane engines.

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Great Lakes Co. Assembling Planes

CARO, MICH., May 17—The Great Lakes Aeroplane Co., recently organized here, has contracted with the Curtiss company for engines, and these are already being assembled in planes.

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Three Truck Firms Merge

CLYDE, OHIO, May 17—The Krebs Commercial Car Co., the Clyde Cars Co., this city, and the Lincoln Motor Truck Co., Detroit, have been merged into one company to be known as the Clyde Cars Co., and to offer to the market five models of trucks, which will be known under the name of Clydesdale.

C. R. Dunbar, of Holyoke, Mass., has been elected president of the new company; J. C. L. Krebs is vice-president and general manager; W. P. Dodge, formerly treasurer of the Barney & Berry Co., has been appointed assistant treasurer and sales manager; J. B. Crockett, president of the J. B. Crockett Co., New York exporter, is treasurer and Homer Metzger is secretary.

The Krebs company factory, with 80,000 ft. of space will be the scene of manufacturing activities, all tools and materials of the Lincoln company having been removed to this city. Plans are complete for further expansion.

—

CAPITAL INCREASES

BATTLE CREEK, MICH., May 14—The Rich Steel Products Co. of this city has increased its capital from $100,000 to $250,000.

SEBRING, OHIO, May 12—The Sebring Tire & Rubber Co. will increase its capital stock from $200,000 to $500,000 and the production will be increased to 200 tires per day. As a result the plant will be immediately enlarged.

A stock dividend of 25 per cent to present stockholders was voted by the directors. The dividend will date from April 1, 1917.

ST. LOUIS, May 14—The Jenkins Vulcan Spring Co., which started in a small way 5 years ago with an initial stock of 100 springs, has increased its capital from $60,000 to $200,000. It is working overtime to keep up with orders.

DETROIT, May 15—The Michigan Storage Battery Co. has increased its capital stock from $50,000 to $100,000.

—

Doble Capital Is $10,000,000

NEW YORK, May 16—Capitalization of the Doble-Detroit Steam Motor Co., formed to manufacture and market the Doble steam car, is $10,000,000. An error on the part of the Telegraph company was responsible for the capitalization being given as $1,000,000 in THE AUTOMOBILE for May 10.

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Ben Hur in Receiver's Hands

CLEVELAND, May 14—The Ben Hur Motor Car Co., capital $1,000,000, incorporated in Delaware, and with its factories and offices at Willoughby, Ohio, is in the hands of a receiver. Charles P. Moore of Cleveland has been appointed receiver. Inability of the company to obtain materials is said to have hampered its activities.

—

FINDLAY, OHIO, May 12—The Toledo-Findlay Tire & Rubber Co. has been sold to the Giant Tire & Rubber Co., Akron. The sum involved was $27,000.

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Hoover 30 Per Cent Stock Dividend

ANN ARBOR, MICH., May 17—The Hoover Steel Ball Co. has declared a 30 per cent stock dividend in addition to the regular 5 per cent monthly distribution.

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Peerless Ships 80 Trucks Weekly

CLEVELAND, May 17—The Peerless Truck & Motor Corp. has shipped eighty trucks a week since Jan. 1, breaking all previous records for the company.

Truck Fender Law Illegal

Chicago Court Holds Ordinance Is Discriminatory and Unconstitutional

CHICAGO, May 14—The much agitated truck-fender ordinance has been declared unconstitutional and discriminatory by Judge Fred A. Smith in the Circuit Court of Cook County. This closes the first chapter of a 2-year record of fight by the truck owners in the city against a flagrant attempt to capitalize for private gain the efforts of the city to safeguard pedestrians.

History of Ordinance

The history of the truck-fender ordinance in this city dates from July, 1916, when the council passed a measure requiring that all commercial vehicles over 1500 lb. capacity and not carrying passengers must be fitted with fenders approved by a city committee. Six months were given in which to test out fenders which local concerns were making an effort to have endorsed by the police department. The chief of police refused to give his endorsement to the devices submitted. The truck owners and their organization, the Motor Truck Owners Association, found it impossible to purchase fenders, and the association believed that the fender makers wanted the city endorsement in order to interest capital to manufacture. On March 16 last a temporary injunction was granted against the enforcement of the ordinance by Judge Smith. At the final hearing Judge Smith ruled that inasmuch as the ordinance does not include the lighter commercial cars and those designed to carry passengers, the ordinance is discriminatory and therefore illegal.

—

Record Quarter for Fisk

CHICOPEE FALLS, MASS., May 12—The Fisk Rubber Co. has started out in 1917 to produce a record volume of business. Net profits in the March quarter are understood to have been sufficient to cover the entire year's 7 per cent dividend on the two issues of first preferred aggregating $9,400,000. In addition, there was a substantial balance left toward the dividend on the $4,500,000 second preferred.

Earnings of more than $3,000,000 net in 1917 are expected. These are compared with actual profits of $1,836,829 in the fiscal year ending Dec. 31 last.

—

Ajax Increases Dividend

NEW YORK, May 12—The Ajax Rubber Co. has declared a quarterly dividend of $1.50 per share, placing the stock on a $6 per share per annum basis. The last dividend declared by the company 3 months ago was $1.25 per share. The dividend is payable June 15 to stock of record May 31.

It is stated that earnings of the combined company, including the Racine Rubber Co., for the first quarter of 1917 were far in excess of any other quarter in the history of the organization.

—

Commonwealth Corp. Adds Office

NEW YORK, May 15—The Commonwealth Finance Corp. has taken half of the second floor in the American Surety Co.'s Bldg., 100 Broadway.

Securities Continue To Decline

Little Market for Automobile and Accessory Stocks—Buyers Holding Back

NEW YORK, May 15—A further tightening in the activities of the automobile and accessory securities market occurred last week, resulting in lower prices. Prospective buyers are holding back waiting for the final decision of the Government on the 5 per cent war tax. There is a normal amount of liquidation in the motor issues, but much of the stock is being covered on the expectation of better conditions and a resultant rise. Traders in Wall Street are more or less optimistic in regard to the motor group and are advising their customers to hold their stock. As a result the market has been quiet.

Fisher and Springfield Body stock last week showed considerable strength. Fisher common rose 2 points, while Springfield preferred went up 10 points. Other gains ranged from a fraction to 2 points. Losses ranged from a fraction to 7 points, featured by Chevrolet.

—

Planning Wisconsin State Fair

MILWAUKEE, WIS., May 12—Plans for the 1917 Wisconsin State Fair at Milwaukee, at which the Milwaukee Automobile Dealers, Inc., again will conduct its annual fall show, are going forward in spite of reports that the exposition is to be abandoned because of the war.

The fair will be made an intensive agricultural project to stimulate next

Automobile Securities Quotations on the New York and Detroit Exchanges

	Bid	Asked	Net Ch'ge
*Ajax Rubber Co.	69	69½	+1
*J. I. Case T. M. Co. pfd.	83	86	—1
Chalmers Motor Co. com.	..	20	..
Chalmers Motor Co. pfd.	..	..	..
*Chandler Motor Car Co.	90¼	95	—3¾
Chevrolet Motor Co.	96	98	—7
Fisher Body Corp. com.	34	38	+2
Fisher Body Corp. pfd.	89	91	—5
Fisk Rubber Co. com.	70	75	..
Fisk Rubber Co. 1st pfd.	103	106	..
Fisk Rubber Co. 2d pfd.	92	95	..
Firestone Tire & Rubber Co. com.	125	128	—3
Firestone Tire & Rubber Co. pfd.	106	108	..
*General Motors Co. com.	105⅜	109	—1⅛
*General Motors Co. pfd.	87½	88½	—1½
*B. F. Goodrich Co. com.	48¾	49⅞	+ ⅛
*B. F. Goodrich Co. pfd.	106¼	109	+ ¼
Goodyear Tire & Rubber Co. com.	197	202	+2
Goodyear Tire & Rubber Co. pfd.	106½	108	..
Grant Motor Car Corp.	4	6	—1
Hupp Motor Car Corp. com.	3	4	..
Hupp Motor Car Corp. pfd.	74	80	..
International Motor Co. com.	..	16	..
International Motor Co. 1st pfd.	..	70	..
International Motor Co. 2d pfd.	..	30	..
*Kelly-Springfield Tire Co. com.	48	51	—1
*Kelly-Springfield Tire Co. 1st pfd.	87	94	..
*Lee Rubber & Tire Corp.	17¾	18	— ¼
*Maxwell Motor Co., Inc., com.	50½	51	— ½
*Maxwell Motor Co., Inc., 1st pfd.	65	68	—1
*Maxwell Motor Co., Inc., 2d pfd.	31	31⅞	+ ½
Miller Rubber Co. com.	190	200	—5
Miller Rubber Co. pfd.	104½	106	+ ½
Packard Motor Car Co. com.	..	150	..
Packard Motor Car Co. pfd.	..	100	..
Paige-Detroit Motor Car Co.	27	29	—5
Peerless Truck & Motor Corp.	11	11½	..
Portage Rubber Co. com.	140	145	—5
Portage Rubber Co. pfd.	..	..	..
Regal Motor Car Co. pfd.	..	24	..
Reo Motor Car Co.	26	27	—2¾
*Saxon Motor Car Corp.	43¼	49	—3¼
Springfield Body Corp. com.	52	57	..
Springfield Body Corp. pfd.	110	117	+10
Standard Motor Construction Co.	12	12½	+ ½
*Stewart-Warner Speed. Corp.	73¾	74¾	— ½
*Studebaker Corp. com.	87¾	88¼	—1¼
*Studebaker Corp. pfd.	103	107	+2
Swinehart Tire & Rubber Co.	65	70	—3
United Motors Corp.	28⅝	28⅞	—1⅛
*U. S. Rubber Co. com.	54½	55¾	—1
*U. S. Rubber Co. pfd.	105½	106½	—1
*White Motor Co.	44¾	45	+ ½
*Willys-Overland Co. com.	27¾	28	—2¼
*Willys-Overland Co. pfd.	93¼	94	—1¾

*At close May 14, 1917. Listed New York Stock Exchange.

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS

	Bid	Asked	Net Ch'ge
Auto Body Co.	..	29	..
Automobile Crankshaft Corp.	..	..	..
Bower Roller Bearing Co.	33½	36	—1½
Chevrolet Motor Co.	96	102	..
Commerce Motor Car Co.	..	..	..
Continental Motor Co. com.	6	6¼	— ¼
Continental Motor Co. pfd.	..	97	..
Edmunds & Jones com.	..	..	..
Ford Motor Co. of Canada	..	235	..
Hall Lamp Co.	..	24⅛	..
Hayes Mfg. Co.	..	..	..
Michigan Stamping Co. com.	14¼	15½	+ ¾
Motor Products	38	..	..
Packard Motor Car Co. com.	..	151	..
Packard Motor Car Co. pfd.	..	99	..
Paige-Detroit Motor Car Co.	27	30	..
Prudden Wheel Co.	..	25	..
Reo Motor Car Co.	26½	26¾	—2½

INACTIVE STOCKS

Atlas Drop Forge Co.	38	41	..
Kelsey Wheel Co.	..	40	..
Regal Motor Car Co.	..	26½	..

year's crop production. One of the biggest features will be the tractor demonstration. Every farmer within a radius of 5 miles of State Fair Park will be asked to allow the use of 5 acres of his land for practical work by tractors.

More than thirty-five tractor makers already have contracted for exhibit space and will participate in the demonstrations. Motor Hall again has been turned over for the exclusive use of the M. A. D.

—

No 1917 Racing Championship

NEW YORK, May 16—The Contest Board of the American Automobile Assn. to-day decided against holding the 1917 racing championship on account of the few speedways that will be active. It also allowed Aitken's 100-mile record of 56:37.65, made in his Peugeot at Sheepshead Bay on Oct. 28, 1916. As a result of war conditions, the Oldfield dinner in Cincinnati has been temporarily postponed.

—

New Trade Literature

SPRINGFIELD, OHIO, May 14 — The Webster & Perks Tool Co., manufacturer of all kinds of grinders, is issuing a convenient pocket table giving comparisons of grinding wheel diameter in inches and millimeters, circumference in feet and meters and requisite r.p.m. to give speeds of different values expressed both in feet and in meters. A celluloid envelope pierced with a slot on each side contains a card with a table printed upon it. By drawing the card out particulars for the different sizes appear opposite the slot and can therefore be read easily.

—

FORT WAYNE, IND., May 11—The Wayne Oil Tank & Pump Co. is publishing Wayne Winners for the benefit of its salesmen. C. E. Pask, advertising manager, is editor of the new publication, and B. F. Geyer is censor.

—

ST. LOUIS, May 11—The Jenkins Vulcan Spring Co. has completed an elaborate catalog and mailed it to 50,000 jobbers and dealers.

New York Marmon Branch Sold

New Organization Headed by Van Alstyne—Will Occupy New Salesrooms

NEW YORK, May 12—The Marmon branch in this city has been sold to the Marmon Motor Car Co. of New York. This company is a new organization, with T. B. Van Alstyne, formerly advertising manager of the Class Journal Co., as president; F. G. Carrie, former manager of the Marmon branch, as secretary, and Chas. Larson, one of New York's most successful dealers, and now handling the Oldsmobile, as treasurer. The new company has taken over the leases of the Marmon branch, and will occupy the new salesroom at Broadway and Sixty-second Street June 1.

—

Doble-Detroit Opens Agency in New York

NEW YORK, May 11—The Doble-Detroit Steam Motors Co., Detroit, has placed an agency in this city at 50 Broad Street under the Doble Steam Car Distributers of New York.

The distributing agency for the Doble in the South and Southeast will be located in St. Louis under the Mid-Western Steam Car Co.

—

Wisconsin Racing Association Planned

MILWAUKEE, WIS., May 12—A Wisconsin automobile racing association is being organized in Milwaukee under the direction of Leslie D. Frint, head of the Frint Motor Car Co., and Chevrolet distributer for Wisconsin and upper Michigan, with the co-operation of Bart J. Ruddle, assistant secretary and manager of the Milwaukee Automobile Dealers, Inc., who will have active charge of the activities of the new body. It is planned to conduct a series of race meets throughout the State, using the State Fair Park 1-mile circular dirt track at Milwaukee, and ½-mile dirt tracks in county fair grounds at various points in the interior. The Milwaukee dates probably will be Memorial Day and July 4, on which occasions a number of novel features of a military nature will be arranged.

—

Uniontown Plans for May 30

UNIONTOWN, PA., May 9—The Uniontown speedway officials are planning a series of local events for May 30, including a 112½-mile race for dealers and two other local events at 11¼ miles. There will be a special exhibition event with a handicap race ending the day.

—

Potatoes in Sheepshead Speedway Field

NEW YORK, May 14—The big acreage circled by the 2-mile track at the Sheepshead Bay Speedway will soon be planted with potatoes. This plan was made known to-day by Harry S. Harkness, president of the Sheepshead Bay Speedway Corp.

—

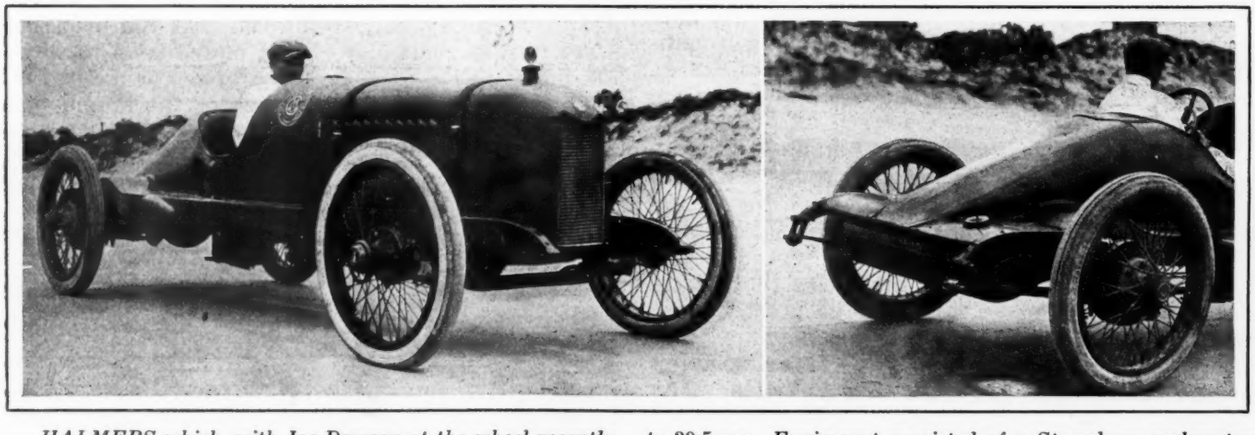
U. S. Releases Indianapolis Speedway

INDIANAPOLIS, May 14—James A. Allison, secretary-treasurer of the Indianapolis Motor Speedway, received a telegram yesterday from the aerial division of the United States War Department stating that the speedway which recently was offered to the Government as a site for an aviation training school had not been considered in the first three fields accepted and that the Indianapolis Motor Speedway was released from all obligations to the Government.

—

Metz Agency for Brazil

ROSARIO, BRAZIL, May 12—C. H. Hansen, one of the largest importers, has become distributor of the Metz car for the entire territory. An order has been placed for immediate delivery of fifty of these cars.



HALMERS which, with Joe Dawson at the wheel recently made a 1-mile straightaway run in 38.1 sec., or nearly 95 m.p.h., on Pablo Beach, Jacksonville, Fla. Joseph Tracy, representing the contest board of the American Automobile Assn., was in charge of the trial. The car was driven for seven trials, the times varying from 38.1 sec. for two of them to 39.5 sec. Equipment consisted of a Stromberg carbureter, Westinghouse starting and lighting, Remy ignition and Rajah spark plugs. Wire wheels and Silvertown cord tires were used. The gear reduction was 3.5 to 1. Note peculiar construction of rear deck. This is designed to reduce wind resistance.

The Automobile

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We Must Build Tractors

FOR the adequate feeding of the civilized world many millions of acres must be put under cultivation with all possible speed. To do this means that the world *must* produce agricultural implements, and tractors to haul them, in vast quantities.

The world has only a certain amount of steel to use for all purposes. To-day it is as important that we build tractors and plows as that we make munitions; not only now but for some years to come after the war, cultivation will be more important than reconstruction in the war zone.

For the greatest supply of the implements of cultivation the whole world looks to the United States. What part in this work is going to be taken by the automobile industry?

The logical answer is that the automobile manufacturers, with their vast machine shops, their assured supply of raw material already bought, should make the building of the tractors *their* job, *their* share of the burden of war.

We must not waste much time over the design. Many passably good tractors will be greatly more useful than a few excellent machines, and we know enough to-day to be able to choose from existing designs several that are more than passable. Any automobile manufacturer with a completely equipped factory could be turning out usable tractors in quantities in 6 months time if he started in right now.

Materials are the limiting factor. It will be necessary to convert to tractor making much of the material already scheduled for passenger automobiles; it is absolutely essential that this fact be grasped and grasped quickly. There is no doubt whatever about it.

That this is true is perhaps a blessing for the industry. The present is a time for necessities first and all other things afterward. While the automobile is a necessity it does overflow into the luxury class; if the majority of cars are doing really useful work for their owners there are still very many that are not. We can afford for a time to cut down the production of passenger cars while we make tractors, and to do it without fear for the future.

Let the start be made swiftly.

Better Understanding

IT is apparent that the educational campaign being conducted by representatives of the automobile industry at Washington is bringing results. Congressmen who a week ago were determined to force through the 5 per cent tax on sales at the factory have come to realize that its results would be far more serious and widespread than they could have imagined without the basis of such information as the manufacturers have been bringing to their attention.

Protests have poured in by thousands from all parts of the country against the proposed tax warning Congress that the passage of such discriminatory and unjust legislation would be highly detrimental to the business interests of the country at large.

Congressmen are beginning to realize that the automobile industry is not an industrial El Dorado, but is a common-sense business. They are coming to recognize the great extent of its ramifications throughout the entire economic structure of the country. In short, the storm of criticism and objections created by the proposed tax has brought home to many members of Congress the indisputable fact that levying on sales at the factory would be a deliberate blow against the already strained vitality of one of the country's greatest industries.

It is well that Congress should be brought to realize these facts; first, to the end that the proposed 5 per cent tax on sales should be defeated; second, for the adoption of some more practical method of utilizing the willing co-operation of the automobile industry, such as a tax on profits or some other suggested form; and third, because in handling legislation connected with the automobile industry from time to time it is essential that these men should understand fully and clearly its economic status and resources.

Semi-Stock Racers

ONE of the outstanding features of the cars taking part in the first speedway races of the season at Uniontown last week was the fact that a large proportion of the cars in the Universal Trophy race might be characterized as semi-stock creations. In other words, the stock factor seems to be gaining in speedway racing.

Farm Tractor Design—I

The Kind of Machine That Should Be Built

This is the first of a series of articles dealing with the problems to be overcome in producing the vast quantity of tractors essential for increasing the world's food supply

By A. Ludlow Clayden

1—Big market awaits the *good* tractor.
2—Mechanical mistakes are not likely.
3—Engine is the principal essential unit.
4—Power a direct index of work ability.
5—Impossible to set definite price limit.

THE tractor industry is no flash in the pan; it is as real, as lasting, and as important as the automobile industry; perhaps more solid, even. It is not a business to go into with the idea of big, quick profits and hang the rest. It is a business to enter with the idea of building up a great firm.

Taking the manufacturers who to-day do make or could make tractors, and there are hundreds of them, a dip into the future, ten years hence say, would show twenty of those firms as the leading tractor manufacturers of the world. Among that twenty would be some who are making tractors to-day, May, 1917; but the possession of a big tractor output this year is no assurance that the maker will not be in some other line of business in three years' time. The man who can have the highest hopes for the future is he who is making *the tractor which gives the least trouble and continues to do good work.*

No Price Limit

The question is often asked "Is there not a price limit for a popular machine?" The answer is quite definitely no. There may be an idea at the present that $1,000 is a goal to strive for in designing a three-plow machine; that other sizes ought to fall between specific limits of price; but it is impossible to uphold this view in argument. Of course, the farmer will buy as cheaply as he can, but he will no more buy the lowest price tractor than he will the lowest price automobile or anything else.

Let us not forget that tractor service is the hardest of all, that a truck has an easy life by comparison, and we instantly see that good workmanship in the engine and transmission is absolutely essential. Poor workmanship means disaster, and the cheapest tractor is likely to be the most expensive over a period of, say, a year's work. The big chance in this industry now is for *good* tractors. If they are made good in the first instance they can be cheapened later, in proper manufacturing sequence, but in this day every tractor builder is but digging the foundation for the house of his reputation. The man who takes chances with the foundation is likely to find cracks in the building after it has stood a while.

Just to cite a single example of the sort of harm too great a care for cost can do. In the open market there can be bought very cheaply cooling fans and pulleys for them. There is no stock equipment of this sort, made for motor trucks, of course, that is big enough for tractor work. To use the stock articles dooms the farmer to perpetual belt trouble, means that the water will boil, the engine run hot and eventually damage itself thereby. The dollar or two extra for properly massive fans and fan drives will be earned back by the machine in the first few weeks.

Remember that a small manufacturer does not buy the cheapest machine tools he can get. If his ability to buy new tools is limited he is more likely to buy a good one while he is about it, knowing that it will last long and work economically. The business of the tractor industry is to show that the tractor which does the best work and keeps on doing it longest is the best proposition.

And the tractor need not be so very expensive at that. The engine is the main essential; the transmission next. After these the frame, wheels, etc., can be of cheap material and rough construction. There is no finish to think about. A good coat of paint protects from rust.

Avoid Foolish Restrictions

What we want to avoid is foolish price "ideals." Suppose a three-plow machine, with the proper workmanship and good design, can be sold for $1,200 or $1,500, or any other similar figure; then it is not wise to "trim" it so as to allow it to be marketed a couple of hundred dollars cheaper. It may be argued that the farmer does not know the difference between cast and cut gearing. Perhaps he does not now; BUT HE WILL.

The fascination which tractor design is exercising upon the minds of automobile engineers is a little unexpected. The tractor did not immediately grip the imagination in the way that the aeroplane did, yet slowly and surely our engineers are finding themselves in the act of thinking out how they would build a tractor.

There is something much deeper in this than the mere business opportunity. Just as almost every automobile engineer worth his salt has pined to design a racing car, so are they pining to-day to build a tractor.

Now the building of a tractor is both easy and difficult. Compared with the task of producing a good automobile ten years ago it is child's play to build a tractor which will have the requisite power and be reasonably efficient; but there are very little data available to enable us to judge whether the machine which seems to be doing so well is really the sort of thing it ought to be.

For example, we do not yet know what the speed should be. With plows as now made it is generally thought that from two to two and a half miles an hour is the best speed, but plows have been built to suit horses for centuries, and it may easily be discovered that greatest economy results from plowing at three times the speed with a different sort of plow. The milling machine has ousted the planer for many classes of work. The planing machine was a development from the cold chisel, the milling machine was something new that came *after* we were accustomed to the idea that mechanical power would be used for machining metal.

The design of agricultural machines is a fairly modern art, but the implement maker has always had to assume horse traction for the field machines; now that he no longer has this limitation to face it is possible, and even probable, that we shall see new plows and other implements which will not be used just as the horse-drawn ones were used. This will react upon the tractor, altering in some ways its specification, so it is fairly safe to predict that it will be ten years before tractor engineering has reached a stage of development comparable with that of the automobile to-day.

The Type the Trouble

Thus the engineer's difficulty is more to decide what sort of a machine he wants to make than actually to make it. When the broad outline is settled the "inking in" is not so hard. Here it is that automobile experience comes to our assistance. There are problems for the tractor engine designer, but he can be sure of laying out an engine which will be fairly satisfactory. With the transmission, it may turn out rather inefficient, but we know so much about designing gearsets that *mechanical* mistakes are improbable to the last degree. To sum up, we can design and make without much difficulty any single unit of a tractor, relying mainly upon automobile experience. What we cannot yet do is to be sure the choice of the sort of units and their method of arrangement are correct.

Take one especial feature, that of turning. A four-wheel tractor needs a fair width in which to reverse its direction, which means that the land is plowed by the ordinary process only in the center of the field. Of course this covers the bulk of the surface, but there is a wide strip left which has to be plowed in a different direction. It is not difficult to plow the last parts, but to what extent it pays to alter the design of the tractor to reduce its turning circle we have got to find out by experience. Some machines will turn literally in their own length; others require a "land" at each end of the furrow of 40 ft. or more. To get the short turn and so cut down the "land" means at present some complication in the transmission; engineers have got to find out whether it is worth while or whether we can get a short turn machine without any offsetting drawback.

Probably the first thing upon which some semblance of agreement will be reached is with respect to size and power. In trucks we have 1-ton, 1½-ton, 2-ton, 3-ton and 5-ton as the standard list of capacities. There are larger trucks, but the three smallest are the most used. In tractors we have no such convenient rating for laying down a list of types. Sometimes horsepower is mentioned; more often a machine is classified by the number of plows it will pull in "normal" circumstances, and thus we get two-plow tractors, three-plow tractors, and so on. Unfortunately this means very little either to engineer or farmer, because the nature of the earth and of the plow, together with the speed of operation, are factors just as important as the mere number of plows.

Power Truest Index

From an engineering viewpoint the drawbar and the speed will probably come to be the most used factors—the drawbar horsepower that is. But this is not likely to be accepted readily by the farmer as a means of rating for some time to come. His question is "What work will it do?" and we have got to find some way of telling him in terms which he can appreciate.

It might be possible for the tractor division of the S. A. E. standards committee to set up some definitions which would translate drawbar horsepower into number of plows. If agreement could be reached as to the speed at which rating should be made, say 2 m.p.h., and also as to the drawbar required per plow, say 1000 lb., under normal conditions, we could then rate a tractor in terms of number of bottoms, once the drawbar at the standard speed was known. The writer believes that it will not take very long before the farmer discovers the meaning of horsepower with respect to the ability of a tractor, so that if he knows a machine will deliver so many horsepower continuously he will immediately know what it will do with plows and with all the other mechanisms that a tractor has to operate.

The case is not on all fours with that of the truck. Power in a truck is no index to its carrying capacity, but power is a direct index of a tractor's usefulness either for towing implements or for driving stationary machines. For a threshing machine, for example, the engine power required at the belt is a very definite thing, and a farmer who wants to use his tractor for driving a particular thresher already knows that the tractor engine must have at least so many belt horsepower.

Belt Horsepower Important

The question of driving threshers and similar machines may have a profound effect in settling the range of sizes in which tractors will be built. Apparently a tractor with less than 25 to 30 brake-horsepower is considerably limited in this respect—brake-horsepower at the belt pulley that is. On conventional reckoning a trifle less than 10 hp. in the engine is necessary adequately to handle one plow bottom, allowing for the losses in transmission, which are variously reckoned from 30 to 50 per cent. This means that a tractor big enough to drive a fair sized thresher is capable of pulling three or perhaps four plows in most sorts of earth. Machines with 20 brake-horsepower or a little less, commonly called two-plow outfits, can only drive a thresher of uneconomically small size.

Probably the small farmer will be content with a tractor which is big enough for most of his work, leaving out such jobs as threshing. On some farms it may easily pay better to have several small tractors with the handicap of having to get outside assistance for the heavy stationary jobs than to have one large machine; because the large tractor cannot be used to best advantage in the field unless the areas to be tilled are individually large. Also it must not be forgotten that as long as he depends on horses the farmer is safe to have most of them in good condition at any time; if one falls sick it does not stop his work. Much farm work *must* be done at the opportune moment. A factory loses a week's earnings if it is forced to shut down for six days; a farmer may lose many months of earnings by being unable to work as he should for two or three particular days. Thus it is not very safe for a farmer to rely upon just one tractor. Suppose he wants capacity for pulling six plows at once.

One big machine will do this and will also drive a substantial thresher. Two smaller tractors will do the same plowing but will not drive the thresher. Yet with two tractors a breakdown would only slow work and would not stop it. In times of great stress the half-size machine might be made to plow day and night, so offsetting the absence of the second.

Field for Cheap Tractor

In something the same way one sees in the truck field very often that it is better to use three 2-ton trucks than one 6-ton, although the latter might be more economical provided it could be relied upon to operate continuously without trouble; but a breakdown in transportation seldom is vitally important in the way a delay is vital to the farmer.

The very light tractor, which can at the best only pull one plow bottom, will certainly sell in large quantities, but it will do so in much the same way as a Ford delivery sells. That is to say the small farmer can make economical use of a minimum size tractor just as a small tradesman can economically employ a light passenger car chassis. In both cases first cost is highly important because the man cannot raise more than a certain amount of money. In both cases the desire is to get the best improvement upon the horse that the capital available will supply.

Three Sizes Suit Most Cases

But just as no large business would ever handle its transportation with a huge fleet of the cheapest possible vehicles, so no farmer would ever use a smaller tractor than he could afford to buy—up to a three or four-plow size that is. For one thing, the cost of labor is highly important. Two men can handle a very large tractor indeed, and do a vast deal more work with it, than could four men with each a one-man, one-plow machine.

So much for generalities. If we assume that agreement can be reached upon the proper brake-horsepower per plow bottom one thing is clear, and this is that tractors are more likely to be built in multiples of this amount of power than in any other way. Suppose the power per bottom is 5 hp. at the drawbar, the natural sizes in terms of drawbar horsepower would be 10 hp., 15 hp., and so on. Do we need such close steps as this, and how far up the scale do we go to reach the limit? Just at present the prevailing opinion in the tractor factories appears to be that the bulk of the machines called for will be made in three sizes, 10 hp., 15 hp. and 20 hp. at the drawbar, at a speed of between 2 and 2¾ m.p.h. These are otherwise called two, three and four-plow outfits. In this range it seems to be low first cost which is the main factor in the demand for the smallest size, and a good many men in the industry incline to the opinion that for all-round usefulness the 20 drawbar-horsepower machine is the best, better for most work than anything larger and yet big enough to operate economically on almost all the work a medium sized farm has to undertake.

Michigan School Equipment Growing

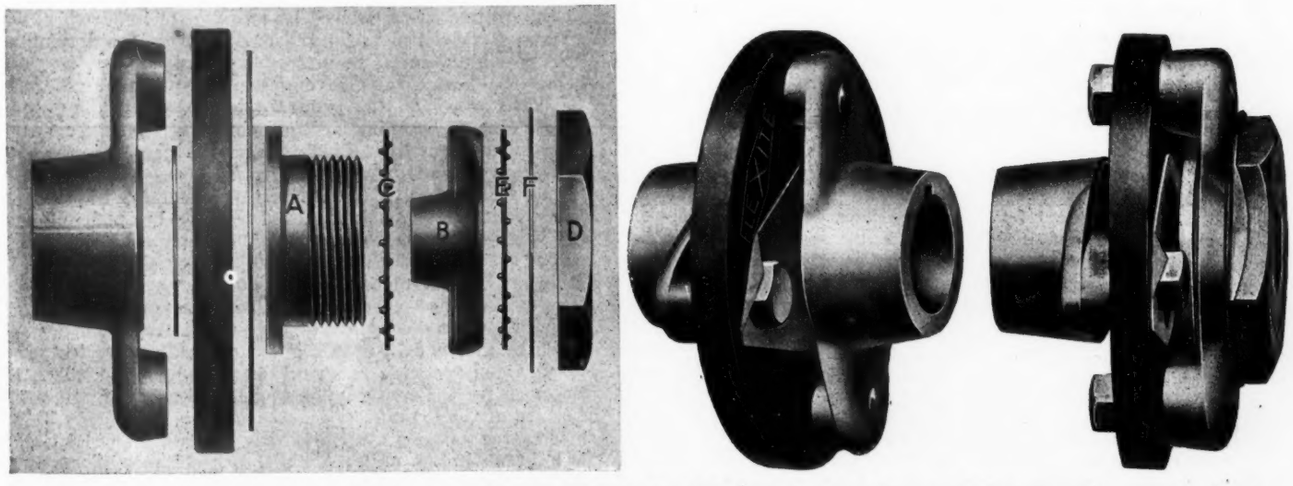
CO-OPERATION on the part of automobile manufacturers in Duluth has greatly assisted the Michigan State Auto School in expanding and adding to its equipment. The latest addition to the shop is a completely equipped Packard Twin-Six. The General Motors Co. has furnished a complete chassis of its 2-ton truck, an Oldsmobile eight, and promises for the future a Buick, Oakland, and Cadillac. More than a dozen other makers have contributed to the school.

As a result of having a variety of cars on hand the school is able to give practical instruction concerning the different types of construction in engines, parts, and accessories. The institution had an enrollment of 800 students at the beginning of 1917, or double that of the preceding year.

The institution now occupies two buildings, the larger of which on Woodward Avenue has 36,000 sq. ft. of floorspace.

Two New Magneto Pump Shaft Couplings

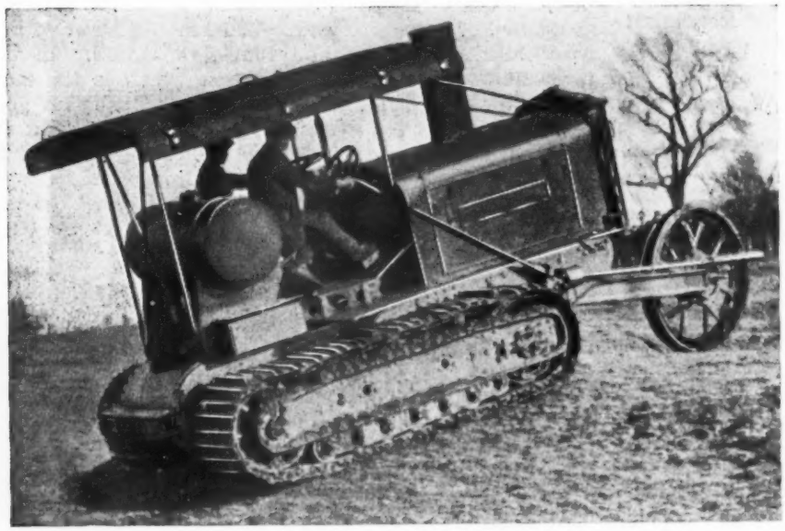
TWO new magneto pump shaft couplings are announced by F. R. Blair & Co., Inc., 50 Church Street, New York. These are both flexible couplings and the difference is that while one is adjustable in the direction of rotation, the other one is fixed. In the adjustable member the flexible ring is of the usual kind and consists of a Flexite disk 2¾ in. diameter, ¼ in. thick. One of the spiders, each of which attaches to the coupling ring at two points, has an integral boss bored to suit either the ⅝ or the ¾ DU-4 taper. The other spider has a plain hole in the center through which passes a thimble secured by a nut and two lock washers of a special kind. It is the thimble which is attached to the shaft so that by slacking the nut angular adjustment can be made with great facility.



Left—Details of adjustment—A, thimble; B, spider; D, lock nut; C and E, special lock washers, and F, plain washer. Center—Fixed type. Right—Adjustable type

British Transport Department Tractor

Caterpillar Machine of Great Power Has Novel Features—Worm Drive Axle and Differential Used—Maximum Speed 6 M.P.H.



Caterpillar tractor designed by the Mechanical Transport Department of the British War Office. Some features of its construction are six-cylinder engine, worm drive and differential

THAT the Mechanical Transport Department of the British Army has been developing designs of its own for several kinds of vehicles is well known. Such designs are usually evolved from machines which have been purchased in the open market and are in some degree composite. Among the latest products of this sort is a powerful tractor of the track-laying type, which is described fully in *The Engineer*, London, from which the following account is extracted.

All comments made on the design comparative with others can probably be regarded as authoritative because *The Engineer* is extremely conservative in matters of this sort. The builders, Clayton & Shuttleworth, Ltd., are an old firm of high standing, and the director of the transport department responsible for the government work on the design is W. F. Rainforth, chief engineer at the Napier plant for many years. Rainforth was recently in the United States and visited many factories while here.

Advantages of Caterpillar

The road chain or caterpillar system of road traction, although by no means novel, is regarded by many people as one of the developments in road locomotion which has been brought about by the war. Such, of course, is not the case. Tractors with this fundamental system of propulsion have been known for many years, but until the present war the main idea of distributing the weight of the machine over the road surface by means of a chain track has perhaps not received as much attention as it deserves on the European side of the Atlantic. That it has advantages over other methods the "tanks" used by the military authorities have clearly demonstrated. The one great advantage obviously is the distribution of the weight of the machine over a very large road surface, giving better adhesion, especially on very soft and uneven ground. In fact, for such conditions the "caterpillar" system seems to be the only feasible method of designing a *self-propelled* machine.

Many caterpillar tractors are already in use for hauling heavy loads, such as guns, on both our own side and on that of the enemy. The Holt machine, which originated in America, has been, and is being, extensively used for such purposes. In this tractor each road chain or track is independently driven from the motor by its own clutch, and the operation of steering is performed by disengaging one or other of the two clutches, allowing one chain to run freely while the machine is driven round it by the other chain.

The firm of Clayton & Shuttleworth, Ltd., Lincoln, recognizing the advantages of the caterpillar system and the urgent demand for tractors of this description both for military and agricultural purposes, has designed in collaboration with the Munitions Mechanical Transport Department of the Ministry of Munitions a machine which differs fundamentally from the Holt, and contains several original features. It is a gasoline-driven tractor in which proved automobile practice has been largly followed both as regards the motive mechanism and the system of control. That is to say, a six-cylinder vertical engine, through the medium of a clutch and gearbox, transmits motion to a worm-driven axle and differential gear which, instead of driving road wheels, gives motion to the road chains by means of sprocket wheels.

Tractor Has Front Road Wheel

In addition to the road chain the tractor has a front road wheel carried in a forked boom or bracket. This wheel serves two purposes—first, for steering, and second, to enable the machine to adapt itself to the contour of the land over which it is traveling. The Clayton & Shuttleworth machine differs from the American machine in that, instead of the bracket being rigid with the main frame of the tractor, it is pivoted so as to allow freedom of movement vertically. The bracket or carriage which carries the front steering wheel is made of rolled channels, 7 by 3 in., pressed to shape and stiffened by cross channels. It has a certain amount of free vertical movement against stiff steel springs, and can be raised clear of the ground when desired by means of a hand wheel worm gear and segmental racks and pinions from the driving seat. The possible vertical movement is about 15 deg. above and below the horizontal. Strong helical springs tend to keep the road wheel on the ground and act as cushions against shocks due to bumping on the ground, a floating connection between the spur lifting pinions and the segmental rack being provided on the transverse shaft.

The front wheel is carried in a steel casting having a projecting arm to which is attached the steering nut. This casting is bored out and the axle forging which connects the front end of the carriage or boom passes through the center, and the main pivot pin is placed in the center of the wheel. The bearings of the front wheel are two bronze rings, 11 in. diameter and 3 in. wide. They are dust and dirt proof and are lubricated by means of a grease gun. A platform on the bracket is provided for men to stand on when starting the engine. So much for the construction and functions of this important feature of the tractor.

The transmission system is very stout and substantial, and is built up in one unit. A multi-disk clutch with seven steel disks alternating with Ferodo friction material transmits through a double leather disk universal joint to the gearbox, which provides for three forward road speeds of 1¼, 3½,

and 5 m.p.h. and a reverse speed of 2 m.p.h. at an engine speed of 1000 r.p.m. The gear wheels are of heat-treated, oil-quenched steel of 120 tons tensile strength. The gear shafts are mounted in bearings of the Hoffman roller type. The gearbox, instead of being split, has large end covers to permit withdrawal of the gears. The shifting mechanism is designed so as to dispense with cross shafts, the gears being engaged by selector mechanism and gate contained in the gearbox itself. The lever is directly above the box and on the left of the driver. The box is very short, stiff, and compact, and is bolted direct to the worm gear casing which forms the final drive to rear axle. This drive takes place through worm gearing with a ratio of 8.75 to 1. The gearbox shaft is coupled to the worm by a muff coupling.

Differential Wheels

The differential wheels are solid with the axle, which is a solid forging terminating in square ends to accommodate the main driving pinions. These in turn mesh with a larger wheel which is bolted to a pair of sprockets and the sprockets drive the road chains.

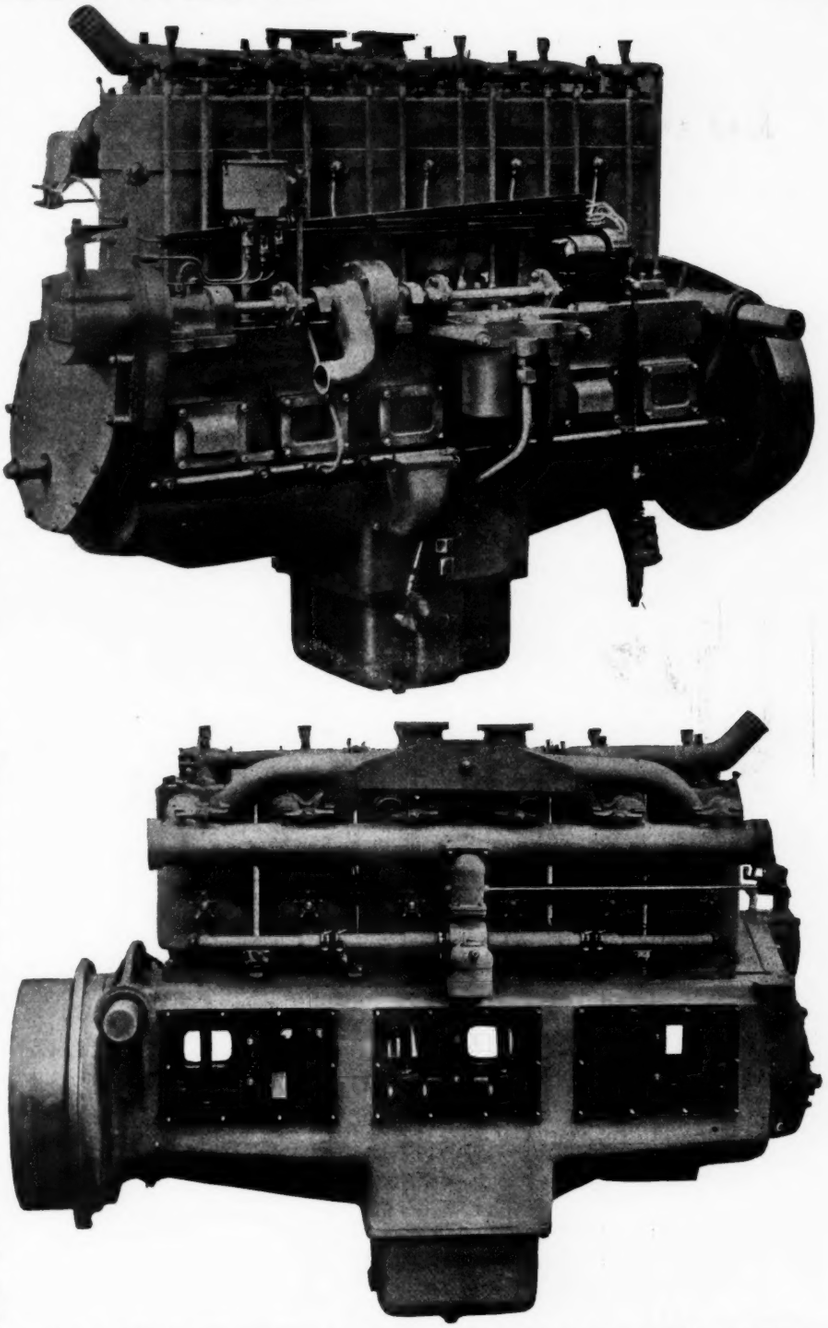
The total width of the machine to the extreme edges of the road chains is 7 ft. 1 in., and between the longitudinal center lines of the chains 5 ft. 4 in., the strakes of which are 1 ft. 10½ in. wide. They are pressed out of 5/16 in. steel plates and are so shaped in transverse section as to overlap each other slightly without making actual contact. These strakes form the track, and are riveted to two link chains which are guided by rollers above and below the pressed steel frame which carries the sprocket wheels. The pitch of the chain is 7¾ in. The main roller truck has seven cast steel rollers 9 in. diameter, mounted on double flexible roller bearings. These take the upward pressure of the road chains. Three top rollers of cast steel 5½ in. diameter, running on plain bronze bearings, support the upper side of the chain.

Trucks Carried on Springs

All rollers are lubricated by holes in the spindles, which are filled by grease guns. The trucks are carried on two laminated springs with 2¼ in. deflection. They work between horn plates forming an extension of the main and outer frames, and are secured endways by two radius rods anchored to one of the cross shafts. and are capable of independent movement. Each chain passes over two sprockets 2 ft. 6 in. pitch circle diameter at the rear of the machine and one similar wheel at the front; the two rear sprockets run loose on the shaft, but are geared up to the differential and drive the chains. All the sprockets have ample bearing surface, and provision is made for lubrication by grease pumps.

The outside frame is supported at each end by the axles of the sprocket wheels and intermediately by a cast steel bracket which carries the operating gear for raising the front boom. Means are provided for adjusting the tension on the chains.

To facilitate turning sharp corners or in limited space independent brakes and brake drums are provided. The drums are bolted to the main driving pinions, and the latter are secured on the square ends of the differential shafts. The drums are lined with Ferodo, and by braking one side of the differential the inner track can be either absolutely locked and made to act as a pivot or any degree of slip for a less abrupt turn can be allowed. To compensate for the gearing-up effect of the differential when the inner track is locked an exceptionally low first speed gear ratio has been fitted.

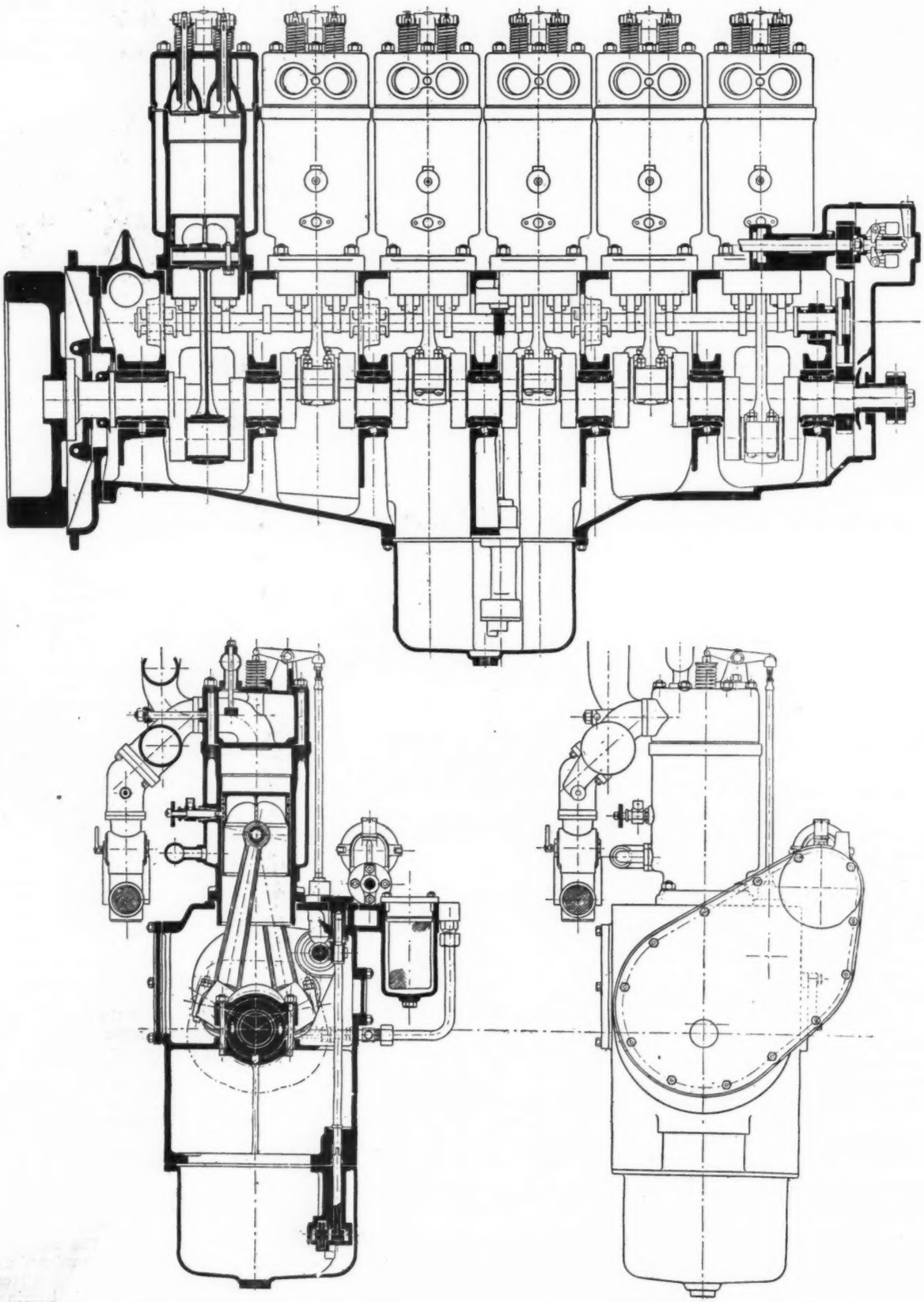


Engine of British War Department tractor. The peculiar oil pan restricts splashing when on grades; note large inspection holes in crankcase

The engine has been constructed by the National Gas Engine Company, Ltd., Ashton-under-Lyne, to the designs of the Munitions Mechanical Transport Department, and has several features which mark a new departure in this class of motor.

The engine has six cylinders, 5¾ by 6½ in. From the illustrations it will be observed that the cylinders are all separate castings, with ample water space, loose heads, and overhead valves. The valves are actuated by rocker levers and push rods from the camshaft and tappets, and means are provided for adjustment of the tappet rods. The camshafts and cams are in one piece, the cams being case-hardened and ground accurately. The main crankshaft is of nickel steel, with seven bearings, 2¾ in. diameter, all the main bearings,

Details of British Tractor Engine



except that nearest the flywheel, being 3 in. long. The rearmost bearing is 4½ in long, and the big end bearings 3½ in. long.

One-Piece Crankcase

The crankcase differs from ordinary motor car practice in that it is cast in one piece, of box section, with large end covers for the insertion and removal of the crankshaft. It is of cast iron, as is also the oil sump, which is secured to it by set screws and nuts and flanges. The pistons are of cast iron of great length, and with three rings above the piston pin. The latter is 1⅜ in. diameter, hollow, and secured by a set screw. The piston and piston pin are lubricated by splash. Inside the top of the piston is a depending point, from which oil which accumulates inside the piston can drip into a hole in the small end of the connecting-rod to lubricate the bearing.

The connecting-rod is of H-section, with die-cast white metal bearings for the big ends, and special bronze bearings at the small end. The timing gear wheels are of steel, with helical teeth 1½ in. wide and 6 diametral pitch. Another helical pinion, meshing with the camshaft wheel, drives a shaft on which is the water circulating pump and magneto, the connection being made by a flexible coupling of leather and steel disks. The water pump is of the centrifugal pattern, throwing 2000 gal. of water per hour, with an engine speed of 1000 r.p.m. The magneto is of the Thomson-Bennett high-tension pattern. For starting purposes, however, another small C.A.V. magneto is provided, apart from the engine. We shall refer to this later.

Machine Work Minimized

The design presents many interesting features. It was desired to reduce machining and erection to the minimum, and with this object in view the bearing caps are so made that a large packing space is left, so that the need to machine the flat faces of the lower half bearings and of the caps is avoided. Furthermore, all bearings, save one, are allowed end play, and all the bearings shells, which are of steel lined with white metal, are plain cylinders. In machining the crankcase for the bearing the caps were put on and adjusted roughly in position by packing pieces. All were then bored through and dowels fitted in the bottom of each. These dowels prevent the brasses from turning, but leave them sufficent end play to adjust themselves to the crankshaft journals. The brass at the clutch end fits without end movement, and the shaft, being provided with large collars bearing against each side of it, is held in position. The whole engine has been designed with a view to the easy removal of any of its parts while in position on the tractor.

We were impressed by the method of suspending the engine in the frame of the tractor, so as to obviate stresses due to torsion of the framework. The crankcase is carried at the flywheel end by a cross shaft, securely fixed in the frame of the tractor, and making a running fit in a bracket forming part of the crank chamber. At the front end the engine is supported on a spherical bearing at the bottom of the crankcasing. The joint between the cylinder and the cover is made water-tight by a copper-asbestos ring on the inside and rubber ring on the outside.

Governor Set for 1000 R.P.M.

The valves are of nickel steel, and the rocker levers which actuate them steel stampings. The engine is fitted with a governor on the end of the magneto shaft, which, by means of a system of levers and rods, operates a throttle valve between the carbureter and the inlet manifold. This governor is adjusted to cut off the supply of air and vapor when the engine speed reaches 1000 r.p.m. Hot air for the carbureter, which is of the Solex pattern, is taken from a muffle round the exhaust pipe, and a shutter arrangement is provided for giving more or less air as required.

The gasoline is supplied to the engine by gravity, being pumped up from the main tank, holding 110 gal. to a tank on the dashboard by a plunger pump on the outside of the crank chamber, operated by a circular eccentric cam on the camshaft through a rocker lever and push rod.

Special care has been devoted to the design of the pressure lubrication system. To commence, the oil sump at the bottom of the crank chamber is filled with lubricant by means of a funnel arranged at such a height as to be easily accessible when the bonnet is opened. The opening of the lid of this funnel also serves to open an overflow valve in the sump, so as to prevent overfilling. In designing the lubrication system special care has been taken to prevent the movement of a large body of oil from one end of the crankcase to the other when the machine is ascending or descending the steep gradients which are likely to be met with in warlike operations. On this account the sump has been made very deep.

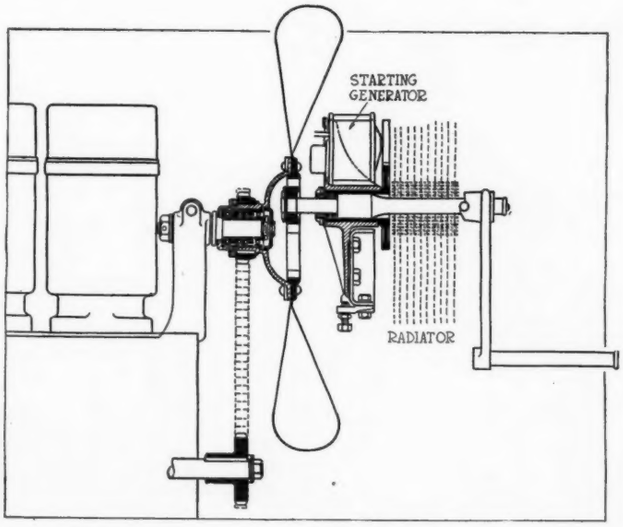
Duplex Oil Strainer

From the sump the oil is delivered by means of a gear pump to a duplex strainer—which permits one section to be cleaned while the other is in action. From this the oil is forced under pressure to a main oil branch, which feeds each of the main bearings, and the oil passes through straight holes drilled through the crankshaft to the big ends of the connecting-rods. A relief valve is fitted in the oil-circulating system, and through this excess oil passes into a sight feed box, from which auxiliary lubrication can be taken if necessary to certain selected points. All the pipes in the lubricating system are straight, and are provided with plugs for cleaning. They are fitted externally, so as to be readily reached, and can be removed as one piece if it is found necessary to do so.

The cooling water is contained in a gilled tube radiator, with cast iron headers, giving 398 sq. ft. of cooling surface, and holding 9 gal. of water. Its side frames are made of pressed steel, and the hot water from the engine enters at the top header, flowing through the gilled tubes to the bottom header, from which it is caused to circulate by the pump previously mentioned round the water spaces of the cylinders and covers. For drawing air through the radiator a fan is provided under the bonnet. It is mounted on ball bearings and is driven by chain gearing from a pinion on the protruding end of the crankshaft.

Magneto for Starting

Combined with the mechanism which drives the fan is a second small C.A.V. magneto [apparently a low-tension generator—Editor THE AUTOMOBILE], which is geared with the starting handle by 2-1 gear wheels. On starting, this magneto supplies current to the sparking plugs in their correct order—1, 5, 3, 6, 2, 4—through a distributer on the main magneto, the latter by an ingenious arrangement being prevented from operating until the engine has commenced to run, thus obivating any possibility of back-firing and accident to the starter. As soon as the starting handle is released by the overrunning of the engine, the auxiliary magneto ceases to work. The starting lever and fan are shown at the foot of this page. It will be seen that a pinion on the starting handle spindle drives an internal gear ring to which is connected a



Starting crank operates through fan and also drives small generator supplying current to main magneto distributor

pitch chain sprocket. The teeth of the internal gear are inclined, so that in the event of the engine reversing they are forced out of mesh.

Tractor Weighs 13 Tons

The total weight of the tractor is about 13 tons, which, distributed over the area of the chain tracks in contact with the ground, gives a pressure of about 7 lb. per square inch. It is capable of hauling loads of more than 20 tons over soft ground and very steep gradients in a manner which is scarcely credible to anyone who has not witnessed the machine at work. The control is only a little more complicated than that of a truck. An interconnected hand lever and accelerator pedal acts on the throttle to regulate the speed of the engine; another lever regulates the timing of the spark; three pedals are provided, one for the engine clutch and two for the brakes on the differential gear, and the change-speed lever is on the left-hand side. Besides the steering wheel, there is a wheel for raising and lowering the front road wheel.

We have witnessed several of these tractors at work on the roads, on soft grass land, and on land which had been plowed, and their operations left nothing to be desired. On the soft plowed land there was very little compression of the soil after the tractor had passed over it, an objection which agriculturists raise against the ordinary system of motor haulage. For this class of work the chief objection which can be raised against the Clayton caterpillar is that it is much too powerful. We saw it haul two four-furrow plows *in échelon* with perfect ease, cross plowing at 3 m.p.h. What we were most impressed with, however, was the manner in which the tractor performed in mud of great depth and on hilly ground. Gradients of 45 deg., or 1 in 1, were easily taken, while the observer was momentarily expecting to see the machine slip down backward.

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Ford Tractor Design in Final Stage

CONSIDERABLE mystery has enveloped the Ford tractor, and it appears at present that, so far as manufacture is concerned, as much, if not more, has been done toward the development of European production as of American.

The design, however, is definitely in the final stage. There is one main unit, this comprising the four-cylinder engine three-speed transmission and worm drive rear axle. The radiator is carried on a forward extension of the crankcase immediately beneath which is a pivot attached to the center of the front axle, which is of the automobile type.

Designed much along the lines of the model T, the engine is very much larger and in every way more substantial. The crankshaft has a wide center bearing and the transmission is proportionately bigger than the Ford car gearset. Thermo-syphon circulation is used and the radiator is a massive truck pattern with cast tanks. The engine is 4 by 5 in. and has the regular flywheel magneto for ignition. The transmission is quite different from the Ford system, none of the three forward speeds being direct. A disk clutch is used and the three ratios are obtained through spur gears controlled by a shift lever of the conventional kind. Overall dimensions are length 8 ft., height 4 ft. 6 in. and width 5 ft. 6 in.

As to the capacity of the machine, a British report states that the experimental machines, of which a number have been shipped over, are mostly drawing two plows, the furrow varying in depth from 9 to 11 in., and that the rate of operation averages 3 hr. to the acre.

On some of the experimental machines the Holley kerosene carbureter, described in THE AUTOMOBILE for May 3, is being used.

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French Ban on Imports Will End Private Automobiling

PARIS, March 30—The decision of the French Government to prohibit all imports will have the effect of putting a stop to all private automobiling. Last year imports exceeded exports to the value of $2,000,000,000, and to release transport and aid in securing a more favorable rate of exchange drastic measures will be taken. For the present the import prohibition order is suspended, but it is expected that it will be applied shortly. A committee has been appointed to examine all cases of exception to the order, but it is intimated that these exceptions will be as few as possible. It is not known yet whether importing firms will be given a general exception for each class of goods, or whether each consignment will have to be considered on its own merits.

It is expected that only just sufficient gasoline will be allowed in to meet military requirements and that private owners will be deprived. Up to the present the French authorities have not placed any restrictions on private motoring outside the war zone. Annual taxes were doubled this year, but this measure applies to all vehicles, whether automobile or horse drawn. Gasoline has increased 50 per cent in price, but there has never been a shortage.

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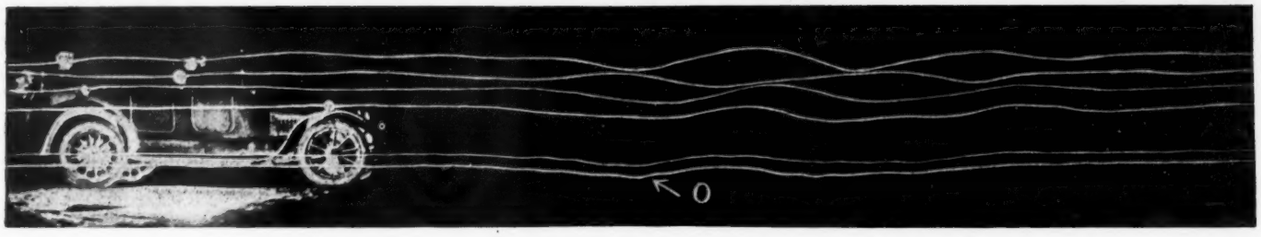
Ambulance Unit for Service in France

A COMPLETE field ambulance unit, consisting of twenty motor ambulances and a repair car and equipment, has been donated to the American ambulance field service for duty in France by J. Dawes, president of the Ohio Cities Gas Co., Columbus, Ohio, and some friends. Gates Dawes, son of the chief donor, and William Dawes, a nephew, will head the unit.

New French Tank

A NEW French armored car built on the same general style as the British tank, but apparently in stronger fashion, has made its début on the French front. It is built in car form and protected with heavy armor, possessing the same ramming power as the British tank. This new engine of war is especially adapted for use in the heavy country through which General Nivelle's troops are now advancing. Powerful machines are required to plow through this almost impassable region.



Photographic diagram of the action of springs and their effects on different parts of the car when striking an obstruction placed on a smooth, level road. The lights can be attached to any part of the car which it is desired to record and the car can be made to travel at any desired speed with the obstruction rising to any desired amount of lift or gradation

Spring Deflections Recorded by Photography

Night Views of Car in Motion Show Relative Movement of Body and Springs—Lights on Various Parts of Car Indicate Cause of Deflections

AN interesting method of performing tests on spring deflections in order to obtain a record of the action of each part of the car has recently been used by G. F. Keys, formerly experimental engineer of the Cadillac Motor Car Co., who has recently joined the ranks of the Standard Parts Co., manufacturer of Perfection springs. The method will be grasped immediately from a glance at the accompanying illustrations showing lights attached to various parts of the car and passengers in the front and rear compartments. The cars were allowed to travel at various speeds and an obstruction of known height placed in the path of the car giving the cause of the deflections.

It will be noted that the bottom line is fixed to the front wheel hub, the next line up to the rear wheel, the third to a point on the front fender, directly above the center of the front wheel; the fourth to the side of the car above the center of the rear wheel; the fifth to the occupant of the front seat; and the sixth to the occupant of the rear seat. The diagram shown herewith reports the car traveling at a speed of 20 m.p.h., and the obstruction is met at the point O. It will be noted that the front hub rises immediately over the obstruction and drops quickly to its former level and goes along a straight path.

Rear Deflection Gradual

When the front hub reaches the obstruction, the rear is considerably behind it, but in traveling over it, follows a path quite similar, except that it will be noted that the deflection at both the front and rear ends of the line given by the rear hub is more gradual. This is particularly true after the obstruction has been passed, showing clearly the effect of the longer springs. In both cases there is a short bouncing action after the deflection has been passed, but it is noticeably less in the case of the rear wheel than in the front.

The light attached to the point on the fender above the center of the front wheel shows the effect of the action of both left and right springs. In the first place the deflection does not make itself felt until after the front wheel has been raised over the obstruction for some time; that is, there is a noticeable lag in the action, and there is a distinctive wave action due to the flexure of the springs before the forward end of the car finally comes to rest again and travels along a straight line. The point on the rear of the car shows a still greater tendency to lag, with a drop before the obstruction is rolled over. This drop takes place at the time when the front wheels are first meeting the obstruction. The rise and fall is much more gradual again at the rear than at the front, and the waves given by the action of the springs in bringing the car gradually back to equilibrium are longer.

The occupant of the front seat feels the effect of the obstruction before he actually reaches it. This is shown by the line, one below the top. The front wheels strike the obstruction while the occupant of the front compartment is a few feet from it, and thus it will be noted that the wave showing the travel of the occupant has begun to rise before the occupant is over the point O. It is a gradual wave motion, with each wave growing longer, until the line is again flattened out to the straight path of travel.

The occupant of the rear settles downward slightly at the time the front springs are receiving the shock due to the obstruction. This is no doubt due to the fact that the rising of the front end of the car tends to slightly depress the rear springs, and the rebound from this, coupled with the effect of striking the deflection with the rear wheels, gives the long undulating wavelike motion which shows how the rear end of the car absorbs the shocks.

This method of testing the effect of spring action is an interesting one and if carried out over a long series of experiments at different speeds and with different heights of obstructions certainly tells the story of what the springs are doing. It is possible to note accurately the travel of every point on the car. The method consists simply of attaching brilliant lights to the points which it is desired to note and allowing the car to travel across the field of a camera whose shutter is open. The photograph of the car was superimposed on the photograph of the lights by taking a flashlight of it after it had traveled across the field. Knowing the desired line for each part of the body, it can be made a matter of experiment on the part of the spring designer to most closely approach the ideal.

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Steps in Repairing Blowouts

WHEN a tire receives an injury extending through all the plies of fabric the repair must be in the form of a section.

First buff the inside of the tire for a distance of 5 in. on each side of the break. Cut through the tread 4 in. beyond the injury on one side and skin it back to a point the same distance from the other side. Lay the tread back so that it will not interfere with the work. Remove the side wall on the injury side for the same distance.

Remove one chafing or bead strip below the injury, starting ½ in. inside the limits of the section. A second ply is then removed, starting ¾ in. above the first ply on the reverse side and running one inch inside the first ply on both ends. Then bevel out the remaining plies around the injury, and thoroughly roughen all surfaces to be repaired. The job is now ready for cementing and building.—D. R. Cain, Instructor, Goodyear Tire & Rubber Co., School of Tire Repairing.

Newman-Stutz Wins at Uniontown

Taylor Takes Universal Trophy Race, Averaging 89.25 M.P.H. —Fetterman's Peerless Repeats at 82.74 M.P.H. in Dealers' Event

Taylor in the Newman-Stutz with which he won the Universal Trophy race of 112 miles on the Uniontown speedway May 10

UNIVERSAL TROPHY WINNERS

Car and Driver	Prize
Newman-Stutz—Taylor	$3,000
Frontenac—Boyer	2,000
Duesenberg—Hearne	1,000
Frontenac—Chevrolet	900
Hoskins—Lewis	800
Johnson—Klein	700
Pugh—Meyer	600
Hudson—Mulford	500
Oldfield-Delage—Oldfield	300
Olsen—McBride	200

DEALERS' RACE FINISHERS

Car and Driver	Prize
Peerless—Fetterman	$750
Haynes—McCarthy	500
Murray—Wynn	400
Haynes—Robinson	300
Buick—Hudoc	200

UNIONTOWN SPEEDWAY, May 10—Driving a steady, consistent race, Taylor, well-known road race driver from the Pacific Coast, but new to Eastern speedways, won the 112-mile Universal Trophy race in his Newman-Stutz in 1:15:38, or an average of 89.25 m.p.h. on the 1⅛-mile track here to-day. Victory seemed certain for Chevrolet's Frontenac until he had to stop to change a plug in the eighty-first lap and Taylor shot into the lead at the psychological moment, his non-stop record standing him in good stead. Boyer, Chevrolet's team mate, captured second place and Hearne's Duesenberg was third before Chevrolet could make up for the precious time lost at the pit, despite his daring driving during the last few laps, in an attempt to repeat his triumph of last year.

The dealers' race was practically a repetition of last year's event, Fetterman's Peerless once more taking first place, making the 112 miles in 1:21:34.8, an average of 82.74 m.p.h., with McCarthy second, although this year McCarthy's mount was a Haynes instead of a Murray. A Murray came in third, however, with Wynn at the wheel, followed by Robinson's Haynes, and Hudoc's Buick was the last to finish, leaving one prize unawarded.

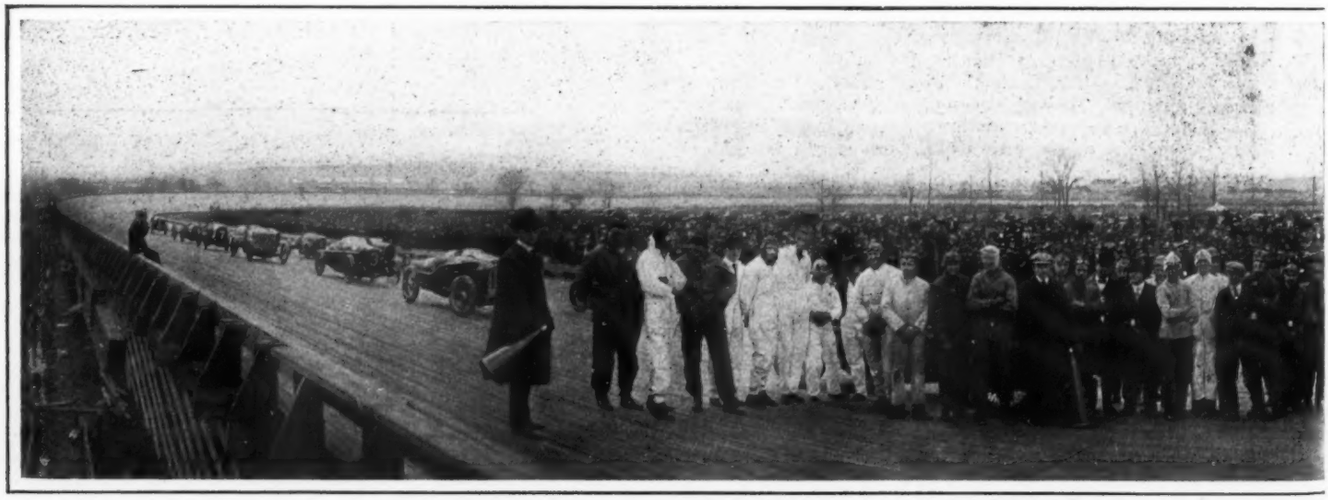
The first car to be forced out of the Universal Trophy race was Fountain's Mercedes, which retired on the thirty-ninth lap with a broken camshaft. Burt's Erbes broke its driveshaft in the fifty-fourth lap and Vail's Hudson retired in the seventy-first with a burned-out coil.

Stuller's Maxwell was the first to drop in the dealers' race, a broken connecting-rod forcing its retirement on the twenty-fourth lap. Monahan's Packard six succumbed to engine trouble in the seventy-first and McFarland in the Murray was ruled off the course in the ninety-seventh lap for foul driving.

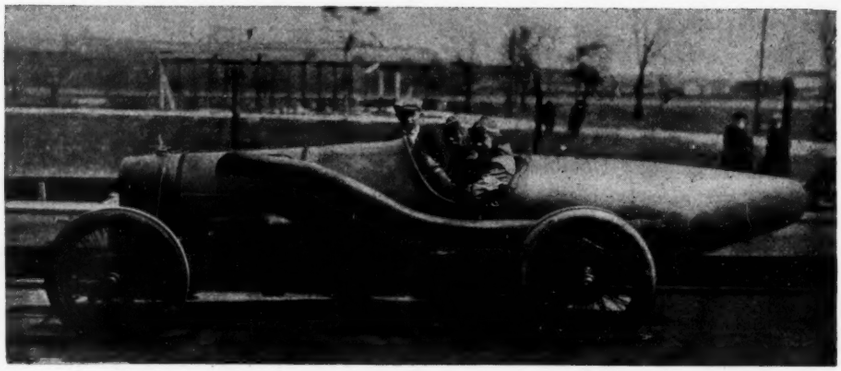
A Financial Success

A crowd estimated at over 20,000 enthusiastically cheered the favorites in both races. Approximately 1000 automobiles of all types and sizes were parked in and about the track and the hillsides and coal trestles overlooking the track were crowded with spectators who were not inclined to swell the gate receipts. A large surplus was available for the speedway treasury after all expenses had been paid, the receipts from the infield alone totaling $30,000 with an estimated total of $20,000 from the grandstand and box seats, indicating gross receipts of $50,000.

Weather conditions were fair, although far from ideal for racing, as a cold wind was blowing and the light was trying, due to alternating cloudiness and sunshine. During the intermission between the two races, DeLloyd Thompson made an aeroplane flight, looping the loop several times.



Panorama of the Uniontown speedway, taken immediately before the races held May 10 and



Left—Boyer, second in the Universal Trophy race, in a Frontenac. Right—Hearne in the Duesenberg with which he won third place in the same event

Chevrolet took the lead in the Universal Trophy race from the start, although he was closely followed by Vail, DePalma and Oldfield. DePalma was the first of these to feel the strain, going to the pits in the eleventh lap to change a left rear, thus forfeiting third place to Oldfield, who blew a tire in the twenty-fourth, leaving Vail and Chevrolet still battling for first place. In the thirty-second lap Vail met tire trouble, repeated in the thirty-fifth, practically putting him out of the running. Oldfield made a determined effort to get into the first rank, but was unable to overtake either Chevrolet or Vail. He lost a precious 90 sec. cooling a universal joint overheated by the pace to which he was pushing his mount.

Taylor Close to Leaders

While these brushes were going on Taylor was shooting his Newman-Stutz around the course at an even, consistent pace without stopping at the pits, but keeping fairly close to the leaders all the time.

About the eightieth lap Chevrolet's Frontenac began to miss and on the eighty-first circuit he was obliged to make his costly stop to change plugs. Taylor grasped his opportunity and whirled into the lead, keeping his advantage despite Chevrolet's frantic efforts to overtake him, during which the Frontenac circled the saucer at over 105 m.p.h.

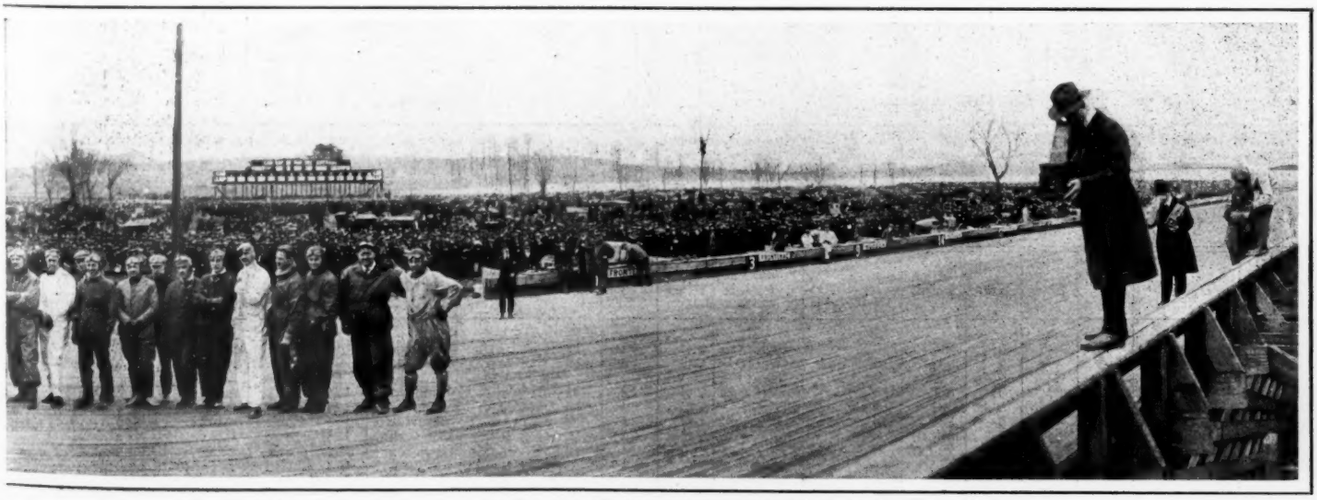
The pit stops were numerous, DePalma stopping four times for tire and engine trouble. Fountain's Mercedes made two stops before its final retirement, both for tire trouble. Vail's Hudson stopped three times; Chevrolet's Frontenac, Oldfield's Delage, Lewis's Hoskins, and McCord's Crawford all stopped twice. Mulford's Hudson, Boyer's Frontenac, and Mever's Pugh each stopped once.

For the first 50 miles of the dealers' race Monahan in the Packard Greyhound and McFarland's Murray fought for the lead in a give and take race which several times brought the spectators to their feet with a burst of cheers. Both cars were forced to undergo severe punishment as their drivers urged them to maximum speed almost from the start till the Packard began to miss and succumbed to engine trouble in the seventy-first lap. Soon after this Fetterman in the Peerless got the signal from his pit to sprint and opened his throttle till he was far in the lead with only McCarthy's Haynes to dispute his title to victory, McFarland in the Murray having been ruled off the course by Referee Chester Ricker in the ninety-seventh lap for foul driving. The Peerless had been lying back all through the race, being content to keep in the same lap with the leaders without running any chance of a strain which might mean elimination. As soon as the Packard and the Murray had worn themselves out in the struggle for leadership, Fetterman shot into the van and maintained his advantage.

In the tenth lap Wynn's Murray was leading with his teammate McFarland close behind. Fetterman came third and Hudoc's Buick fourth with Monahan fifth, Robinson's Haynes sixth and Stuller's Maxwell seventh. During the first twenty laps the cars averaged 81 m.p.h. Shortly after this the battle between the Packard and the Murray began and for the first fifty laps McFarland had made a record of 41:15.6 with Monahan's Packard only 4/10 sec. behind him. At the sixtieth lap McFarland's lead was 7.2 sec. and it was at this point in the race that the Packard began to miss. Fetterman's Peerless took the lead soon after and kept it to the end of the race.

Few Pit Stops in Dealers' Race

As only eight cars started in this race there was comparatively little pit trouble, Stuller's Maxwell being the first to stop, for a right rear, in the eleventh lap and again in the twenty-fourth when it went out with a broken connecting-rod. The Packard made three stops before giving up the struggle, due to engine trouble.



giving an idea of the layout of the track. Note the crowd and the cars parked in the infield

Position and Equipment Tables of Uniontown Races

Position of Cars at Eight-Lap Intervals in Universal Trophy Race

No.	Car	Driver	Laps:	8	16	24	32	40	48	56	64	72	80	88	96	100
7	Newman-Stutz	Taylor		6	5	3	2	2	3	3	3	3	3	2	1	1
3	Frontenac	Boyer		7	6	4	3	3	2	2	2	2	1	1	2	2
5	Duesenberg	Hearne		8	7	5	4	4	4	4	4	4	4	3	3	3
1	Frontenac	Chevrolet		1	1	1	1	1	1	1	1	1	2	4	4	4
12	Hoskins	Lewis		5	4	9	9	8	8	8	8	5	5	5	5	5
24	Johnson	Klein		12	8	8	8	6	6	6	7	6	6	6	6	6
15	Pugh	Meyer		10	13	13	11	9	9	7	6	7	7	7	7	7
9	Hudson	Mulford		9	15	15	15	14	13	11	11	10	9	8	8	8
27	Delage	Oldfield		4	3	6	6	11	11	10	10	9	10	10	10	10
4	Packard	DePalma		3	10	10	13	12	12	13	13	12	12	11	11	11
17	Crawford	McCord		13	14	14	14	13	14	12	12	11	11	12	12	12

Position of Cars at Eight-Lap Intervals in Uniontown Dealers' Race

No.	Car	Driver	Laps:	8	16	24	32	40	48	56	64	72	80	88	96	100
31	Peerless	Fetterman		3	3	3	3	3	3	3	1	1	1	1	1	1
41	Haynes	McCarthy		5	4	4	4	4	4	4	3	3	3	3	3	2
22	Murray	Wynn		4	5	5	5	5	5	5	4	4	4	4	4	3
34	Haynes	Robinson		6	7	6	6	6	6	6	6	5	5	5	5	4
32	Buick	Hudoc		8	6	7	7	7	7	7	7	6	6	6	6	5

Universal Trophy Race on Uniontown Speedway, May 10—For Non-Stock Cars Under 300 Cu. In. Displacement

Car	Driver	Bore	Str.	Disp.	Carb.	Ignition	Plugs	No. Plugs	No. Valv's	Valve Location	Tires	Wheel-base	Wheels	Pistons	Oil
Frontenac	Chevrolet	3 7/8	6 3/8	299.9	Zenith	Bosch	K L G	8	16	Head	Goodyear	104	R W	Miller	Oilzum
Hudson*	Vail	3 1/2	5	288	Hudson	Delco	A C	6	12	Right side	Goodyear	105 1/2	R W	Magnalite	Oilzum
Hudson*	Mulford	3 1/2	5	288	Hudson	Delco	A C	6	12	Right side	Goodyear	105 1/2	R W	Magnalite	Oilzum
Hoskins	Lewis	3 3/4	6 3/4	298.2	Miller	Bosch	Ra'ah	8	16	Hor. in head	Goodyear	105	R W	Magnalite	Oilzum
Mercedes	Fountain	3 7-10	6 1/2	279.6	Mercedes	Bosch	Special	8	16	Head	Goodyear	112	R W	Magnalite	Monogram
Frontenac	Boyer	3 7/8	6 3/8	299.9	Miller	Bosch	Rajah	8	16	Head	Goodyear	104	R W	Miller	Oilzum
Packard**	DePalma	2 11/16	4 1/2	299.2	Zenith	Delco	Rajah	12	24	Head	Goodyear	112	R W	Magnalite	Monogram
Olsen	McBride	3 3/4	6 3/4	298.2	Miller	Bosch	Splitdorf	8	16	Head	Silvertown	107	R W	Magnalite	Mobiloil
Erbes	Burt	3 5/8	7 1/8	294.2	Miller	Bosch	K L G	4	16	Head	Silvertown	98	R W	Miller	Oilzum
Newman-Stutz	Taylor	3 1/2	6 1/2	296.8	Miller	Bosch	A C	4	16	Head	Goodyear	102	R W	Magnalite	Oilzum
Duesenberg	Hearne	3 3/4	6 3/4	298.2	Miller	Bosch	Ra'ah	8	16	Hor. in head	Goodyear	106 3/4	R W	Magnalite	Oilzum
Pugh	Meyer	3 1/2	6	298	Master	Bosch	Ra'ah	8	8	Hor. in head	Silvertown	108	Houk	Magnalite	Mobiloil
Oldfield-Delage	Oldfield	3 5/8	7	289	Miller	Bosch	A C	8	16	Head	Firestone	104	R W	Miller	Oilzum
Johnson	Klein	3 3/4	6 3/4	298.2	Miller	Bosch	Rajah	8	16	Hor. in head	Silvertown	100	R W	Magnalite	Mobiloil
Crawford	McCord	3 3/4	6 3/4	298.2	Master	Bosch	Rajah	8	16	Head	Goodyear	106	R W	Magnalite	Mobiloil

*Six-cylinder; **Twelve-cylinder aviation type engines; all other cars have four-cylinder engines. All cars equipped with Boyce Moto-Meter; all equipped with Hartford shock absorbers except Fountain's Mercedes, which has Mercedes type.

Dealers' Race—112 Miles Non-Stock, for Dealers Located Within 150 Miles of Uniontown

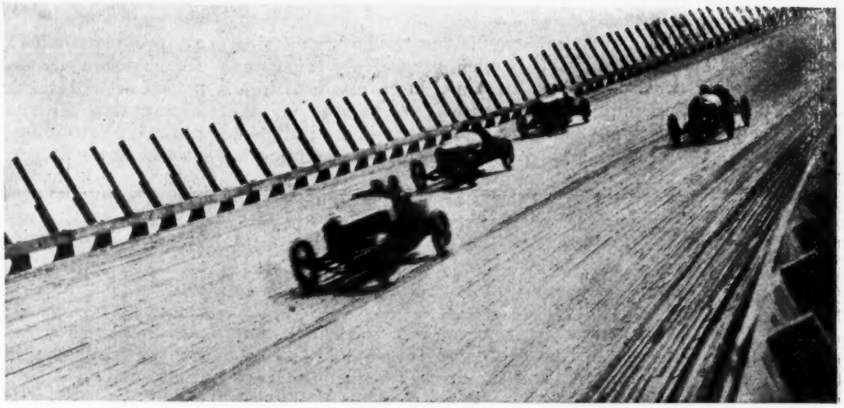
Car	Driver	No. Cyl.	Bore	Str.	Displ.	Carb.	Ignition	Pl'gs	No. Pl'gs	No. Val's	Valve Location	Tires	Wh'l-base	Wh'ls	Pistons	Oil
Packard	Monahan	6	4 1/8	5 1/2	539.5	Miller	Bosch	A C	12	12	Both sides	Silvertown	121	Houk	Vanadium	Mobiloil
Peerless	Fetterman	8	3 1/4	5	331	Ball & Ball	Atwater-Kent	A C	8	16	Inside V	Goodyear	103	R W	Magnalite	Oilzum
Haynes	McCarthy	12	2 5/8	5	356.2	Miller	Delco	A C	12	24	Head	Goodyear	105	Houk	Lynite	Mobiloil
Murray	McFarland	8	3 1/4	5	331.8	Zenith	Dixie	A C	8	16	Inside V	Silvertown	108	R W	Lynite	Wolf's Head
Buick	Hudoc	4	4 1/2	5	300.7	Miller	Bosch	A C	4	8	Head	Silvertown	104	Houk	Lynite	Mobiloil
Murray	Wynn	8	3 1/4	5	331.8	Zenith	Dixie	A C	8	16	Inside V	Goodyear	128	Houk	Lynite	Wolf's Head
Haynes	Robinson	6	3 1/2	5	288.6	Tillotson	Remy	Rajah	6	12	Right side	Goodyear	102	Houk	Lynite	Oilzum
Maxwell	Stuller	4	3 5/8	4 1/4	175.5	Sprung	Simms	A C	4	8	Right side	U. S.	103	Wood	Magnalite	Mobiloil

All cars equipped with Boyce Moto-Meters. All have Hartford shock absorbers, except Robinson's Haynes, which has Gabriel Snubbers.

Vail performed a daring bit of driving near the start of the Universal Trophy race when he blew a tire on the southeast curve of the track. His Hudson was near the top rail at the time and started for the inner rail of the saucer, but within a few feet of the barrier Vail managed to swing it around and shot into the pits. When Taylor crossed the tape a winner, Mulford was in his ninetieth lap; Oldfield was on his eighty-ninth; De Palma his seventy-ninth; and Vail his seventy-first.

All the prize-winning cars, in both the Universal Trophy race and the Dealers' event, used Dixon's graphite lubricants.

Other details of equipment of the cars taking part in both races appear at the foot of the opposite page.



Louis Chevrolet, driving Frontenac, in lead. Notice style of guard rail at top of course. It was this rail that prevented a serious accident during the qualification trials

Heavy Oil Engines Coming?

Two Papers for Metropolitan Section S. A. E. on Engines to Burn Fuels of the Future — Junkers Diesel Engine Built in Small Units Provides Possibilities

HENRI G. CHATAIN, who has designed large engines for the General Electric Co., and Philip Lane Scott, who has recently returned from the German Junkers factory at Aix La Chapelle in ~~Luxemburg~~ Germany, are the speakers at the meeting of the metropolitan section S. A. E. to be held May 17 at the Automobile Club of America, New York.

Professor Junkers has been experimenting with gas and heavy oil engines for many years, and his engines are reckoned among the most advanced in design of the German Diesels, although the Junkers engine is not precisely a Diesel. Some extracts from Scott's paper which follow give an idea of the Junkers system.

The two-stroke, constant-pressure cycle is used, giving a power impulse every revolution and requiring a combustion pressure but little higher than the compression pressure. This cycle as used by all Diesel engines must be carefully distinguished from the one on which most gasoline engines operate; the latter has a combustion or explosion pressure much higher than the compression pressure. The constant-pressure cycle requires a combustion of the fuel such that the pressure neither rises nor falls during the period that follows immediately after the compression period. As a result the ratio of mean effective pressure to combustion pressure can be high.

The Junkers engine has two pistons operating in the same cylinder and moving in opposite directions. The inner piston is connected to the center crank of a three-throw crankshaft; the outer piston is connected through a yoke and side rods to the outer cranks of this same shaft section. In some designs, in which the power can be taken advantageously from two shafts, the side rods are dispensed with and a crankshaft is placed at each end of the cylinder, each piston being directly connected to the nearest shaft. This construction lends itself admirably to submarine work, in which two propeller shafts are used. The pistons are kept in proper relation by gearing or connecting-rods lying alongside the first cylinder of the engine. The preponderating advantage of this mechanical arrangement is the perfect balance of mass attainable.

Since 1914 amazing strides have been made in Germany. The output of the A. E. G. has been so large as to cause this company and the Hamburg-American Line to combine in building Junkers-engined vessels of medium and large tonnage. An island in the Elbe has been purchased for the yards and factory. The A. E. G. at first built high speed types, but is now taking up the large marine engine just mentioned and also submarine, auto-truck and airplane engines.

Of the machines that I have seen myself or whose machinists I have known, there are two 400-kw. direct-coupled dynamo units on one of the German cruisers now in active service; a 250-hp. engine that served continuously for a year for factory power; a similar machine that has operated a government tugboat for a year and is to the best of my knowledge still in operation; a 100-hp. engine on a small yacht; a 1000-hp. stationary machine and a 150-hp. stationary machine. As stated, these are the engines of which I have personal knowledge and are but a few of the whole number in operation.

In addition to the types spoken of should be mentioned an airplane engine of 200-hp., which I saw but was not allowed to examine carefully. It is probable that a similar one of 400 hp. is now on a military Junkers airplane. Also an auto-truck engine was reported to have been successful on the test stand of the A. E. G. and a 140-hp. farm-tractor engine was ordered by a Russian firm just before the outbreak of the war.

The two engines on which most of my time was spent were a marine type of 250 hp. and a stationary type of 1000 hp. The marine engine was of the three-cylinder direct-reversible type, giving 250 hp. at 250 r.p.m.; the bore was 200 mm. (7.86 in.), and the stroke 700 mm. (27.5 in.); the normal mean effective pressure was 10 atm. (147 lb. per sq. in.), and the overload, 15 atm. (221 lb. per sq. in.); pistons were cooled, but without external connection. It had a three-stage air-compressor. This machine was connected to a Junkers hydraulic dynamometer for test purposes.

The original engine from which these engines were developed has several important achievements to its credit, among which can be mentioned the burning of tar oil (a coal distillate), a speed range of from 30 to 300 r.p.m., and a mechanical efficiency of 73.5 per cent (including power for pumps and air compressor.)

It had run for a year in factory service and had been sent to Aachen for experimental purposes in connection with the use of tar oil as a fuel.

Tar oil is little known in America as a Diesel engine fuel, but it is the most difficult fuel to burn properly, though hardly more viscous than water and containing no asphalt. The burning of oils having a high asphalt content is not very difficult, although combustion must be perfect in order to avoid the heavy pitch-like substance that slowly collects on the pistons and prevents lubrication.

Tar oil is a mixture of the three fractions next to the last, pitch, in the distillation of coal tar. It is dark brown in color, a little heavier than water (specific gravity 1.040 to 1.150) and contains a hydrocarbon very similar to carbolic acid in structure, which gives the oil a corrosive action on metal and makes a strong irritant on the skin. Its use in Germany was

becoming a necessity, owing to the scarcity of crude oil distillates.

Perhaps because its hydrocarbons belong to the benzol ring and not to the benzine chain, this oil is excessively tenacious of its chemical energy, and as compared with crude oil distillates, requires an immense amount of heat to start oxidation. Once the reaction has commenced, however, it has a tendency to burn explosively. Greater initial temperature is necessary for tar oil to start combustion, but, because of its tendency to burn explosively, this is an undesirable feature the moment combustion begins. It was not an easy problem, but it was solved eventually and the engine can be started cold (16 deg. C.) with tar oil. It is the only engine that has accomplished this. The double piston lent itself admirably to the solution of this difficulty.

Because of the very high compression (about 700 lb. per sq. in.) in the Junkers engine the temperature in the combustion space is much higher and the pistons become and are allowed to remain considerably warmer than is the usual practice. The oil is sprayed into the cylinder in two fans, one directly across the face of each piston when they are at the inner dead center. The high heat capacity of the iron promotes warming of the oil far more readily than air, aiding the initial combustion. But as soon as the pistons recede they draw with them the thin layer of burnt gases formed by the initial combustion and lying between the piston head and the oil spray. The hot metal then exerts no influence on the oil, and two oil layers inclose the hot compressed air and retard the explosive effect.

Since injection of fuel takes place during from 30 to 40 deg. of the crank circle, the oil spray is relieved of this too intense heating necessary to initial combustion during the greater part of the injection period. In a single-piston engine this would be impossible, since, if the fuel valve is vertical, the oil strikes the piston continuously during the injection; if the valve is horizontal, the fuel spray always remains in close proximity to the cylinder head.

Wide Speed Range

This engine is direct reversible. It has a speed range of 30 to 300 r.p.m. To make possible this wide speed range a special valve gear is used; this changes the angle of advance, the period of injection and the lift of the fuel-valve needle with each variation in speed or load. These changes are necessary to permit slow speed and high speed and also fuel economy at light load.

With fixed cam action the speed of injection of the fuel (time element of injection) remains constant regardless of the engine speed, since it is dependent solely on the injection-air pressure. Also the speed of combustion remains constant. Hence, when the engine runs slowly and the angle of advance, period of injection and valve lift all remain the same as for high speed, the fuel will be shot into the cylinder and will have time to burn, perhaps even before the pistons have passed their inner dead center. Of course, then, there is no longer a constant pressure combustion, which is the basis of Diesel engine design. Either the safety valves blow or the bearings or crankshaft are damaged and sometimes broken. More often the fuel-valve needle is forced open and the valve seat and pulverizing element injured.

If the engine runs still more slowly, the oil is injected and begins to burn, but the fuel valve remains open for the same percentage of the stroke, and compressed air blows through the valve for the entire period after the oil charge has been injected.

The reverse is true at high speed. The fuel valve is not open for a time period long enough for the complete injection of the fuel, and the engine under load cannot have its speed increased or the output falls off. In addition to these elements of danger and of stalling, the fuel consumption is enormously increased, because what appear as but slight changes from correct injection conditions will very greatly affect the combustion. So much energy is handled in so small a space when a cubic centimeter of oil is injected, that it must be done with great exactness to secure the intended results.

For these reasons Professor Junkers has developed this variable injection control combined with the fuel control. The angle of advance can be regulated for each cylinder alone if desired. Further, the injection air pressure can always be immediately controlled from the machinist's stand.

The two levers that controlled this engine were so arranged that the fuel and air for starting could be either operated independently, effecting a great saving in air and allowing much greater speed of reversing in the hands of a skilled machinist; or interlocked, avoiding dangerous conditions when operated by an unskilled machinist. Reversing could be accomplished in from five to six seconds. This engine was started 96 times on an air supply of 19.5 cu. ft. originally at 85 atm. (1250 lb. per sq. in.) pressure.

Although the amount of heat transmitted to the cylinder walls of this engine is 1330 B.t.u. per sq. ft. per min. yet the pistons are not water-cooled. They have, however, a special self-contained cooling device, which prevents the temperature of the piston head from becoming excessive.

Three New Engines Ready

Supreme Motor Co., New Cleveland Concern, Announces a Four, Six and Twelve — High Quality Engineering Shown in Design

THE latest additions to the ranks of stock engines are the Supreme motors made by the Supreme Motors Co., Cleveland. Three types are announced, a four, a six and a twelve, the two former both having cylinders 3¼ by 5 in. and the twelve a stroke of 5 in. with either 2½ or 2¾ in. bore.

The design throughout is in accord with conventional practice of a high grade of engineering and there are no radical or specially new features. Lubrication is a noteworthy point, as it is fully forced through both crankshaft and camshaft on all models. The four and the six have dip troughs in addition, but the twelve is not so supplied; instead there are tubes fixed to the connecting rods which carry oil to the piston pins. In each engine the piston pins are secured to the pistons and the material used is iron; although a choice is given on the twelve, aluminum alloy being given if desired.

All oil leads in each engine are integral with the crankcase and internal, the only outside fitting being the level gage. Provision is made for attaching a pressure gage also if desired.

In all cases the crankshafts are counterweighted, the four having three main bearings and the six four, and twelve three bearings. The diameter of the shaft is 1⅞ in. in each case. Bearing lengths are as follows:

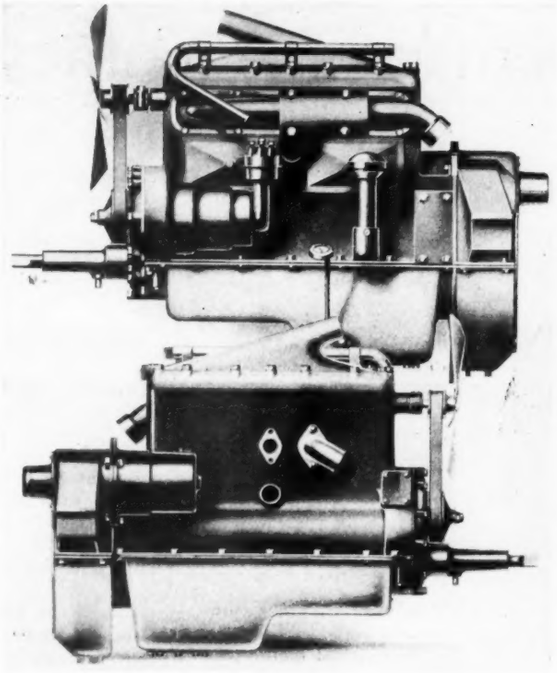
	Four	Six	Twelve
Front	2 1/16	2 7/16	2½
Intermediate	2	2 (2 int.)	2⅞
Rear	3½	3¼	3⅝

On the four and the six either syphon or pump cooling can be used, the twelve being arranged for the latter kind only. Fittings of any standard kind in the way of electrical equipment, carbureter, etc., are allowed for.

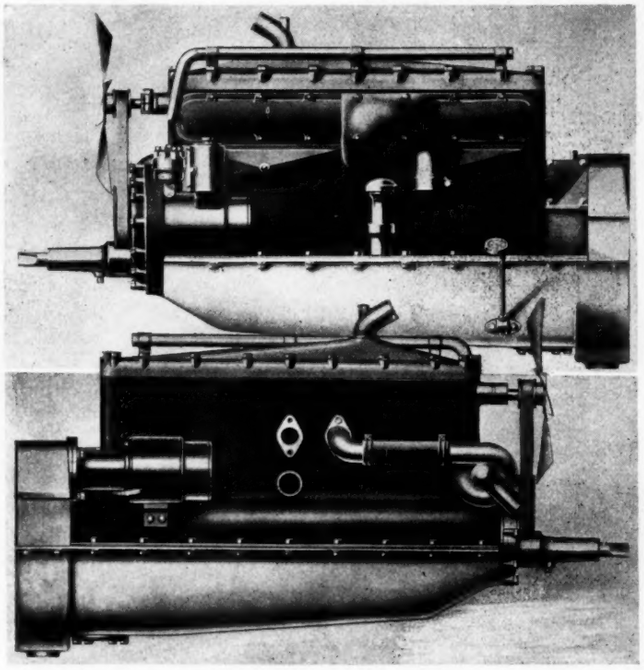
For the twelve L head cylinders are used cast in solid blocks, but the four and six have detachable cylinder heads. An ingenious detail is the way in which the exhaust passages are half within the cylinders and half in the manifolds. The intake passage is arranged so that the exhaust comes directly against one wall, the other side being water cooled; thus the intake is thoroughly heated and yet is unlikely to get too hot.

For front end drives spiral gears are used on the four and six and a silent chain on the twelve, this being adjustable by rocking the generator on its flange mounting.

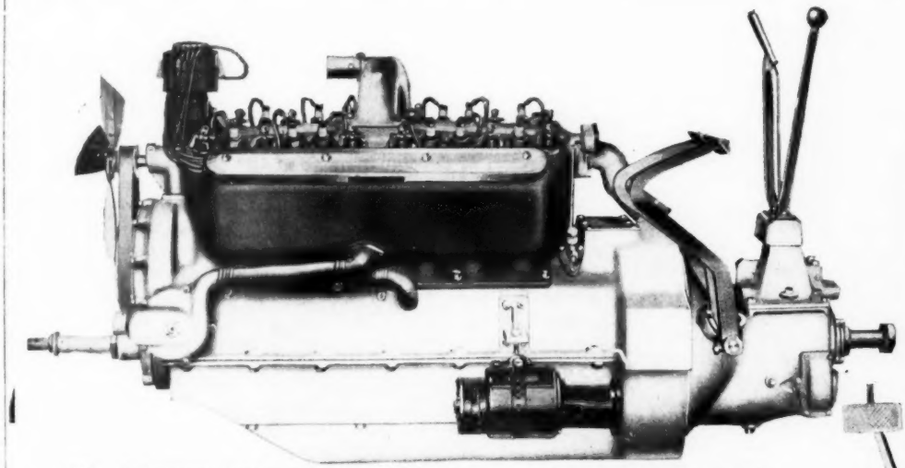
Supreme Four, Six and Twelve



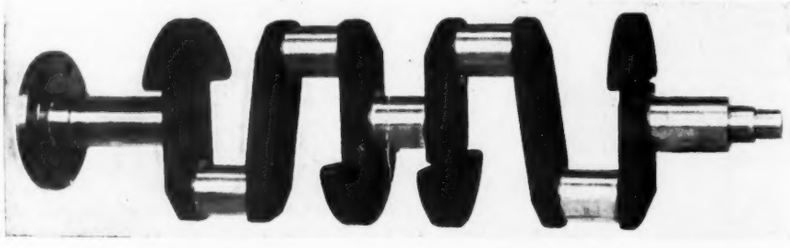
Both sides of four-cylinder model which has a bore of 3¼ and a stroke of 5 in. Lubrication, as on the other models, is forced through both crankshaft and camshaft



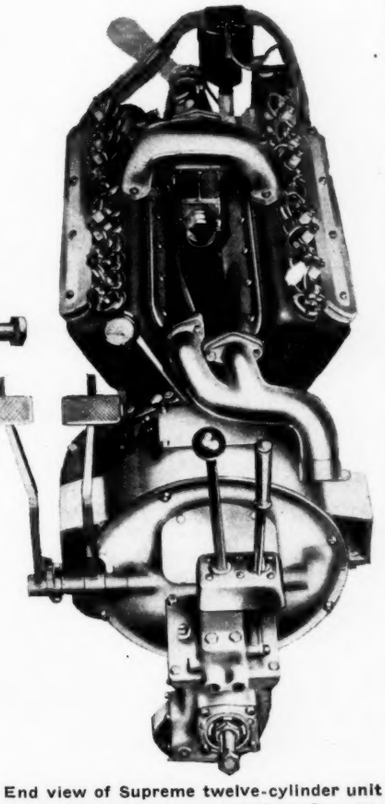
Supreme six, showing clean design and neat mounting of starting and generator units. Like the four, this engine is 3¼ by 5 in. and employs dip troughs in addition to force feed oiling



Side of Supreme twelve-cylinder model which is made with either 2½ or 2¾ in. bore. Stroke is 5 in. Instead of using dip troughs the twelve has tubes fixed to the connecting-rods which carry oil to the piston pins



All Supreme engines have counterweighted crankshafts. Above is illustrated the four-cylinder model, which has three main bearings; the six has four and the twelve has three. The diameter of the shaft is 1⅞ in. in each case



End view of Supreme twelve-cylinder unit power plant, showing mounting of accessories in the V and single exhaust pipe connection to manifolds

Moto-Meter Manufacture Demands Accuracy

Boyce Instrument Made To Register the Temperature of the Air Above Automobile Radiator—Accuracy of Inspection Important—Much Detail Care

Attaching bulb to thermometer tube of the Boyce Moto-Meter

NOW that an engine cannot run properly unless it is sufficiently warm, some means of indicating when the jacket water is too cool is really necessary. The natural assumption would be that the best sort of an indicator would be a thermometer placed so that it could be easily read, but this is hardly the whole truth, although it is part of it. The ordinary thermometer indicates degree by degree over a large range, and the temperature of an engine we only require to know over quite a small range. If it is much cooler than 150 deg. Fahr., it is too cold, if it is over 200 deg. it is dangerously hot. Thus the ideal indicator should have a very open scale between these temperatures.

This can be done with a thermometer, but not easily, and the essential feature of the Moto-Meter which makes it differ from a thermometer is the method by which the whole range is concentrated within just that portion of the scale required. The basic patent in the Moto-Meter is the idea of registering, not the temperature of the *water* in the radiator, but that of the *air above* the water. At the start air and water are the same temperature, but as the system warms up the air becomes more and more humid and with the increase in humidity its temperature comes increasingly nearer to that of the water. This means that while the water is warming up from as low as freezing point to about 100 deg. the air remains fairly cool and the effect on the meter is slight. Thereafter the air heats rapidly, so the column of liquid begins to expand fast. It is this that allows the whole gamut from freezing to boiling to be confined within a length of indicator of about 1½ in. There is one other advantage in taking the temperature from the air instead of from the water, and this is that the quantity of water does not affect the indication very much. If the water is low and heats up rapidly, the heating will be shown just as readily as it would with the system filled.

Accurate Manufacture Necessary

Such compression of the thermometric scale necessitates highly accurate manufacture and the making of the Moto-Meter is an interesting study. It is one of those essentially simple things which is by no means easy, and a type of production in which accuracy of inspection is all important. For the small size and cost few articles require so much detail care.

The outside frame, a Dohler die casting, is the simplest piece. It has a little machining; tapping a few holes, and it is enameled or plated and polished. The dials, glasses, etc., are simple, though several different sets of dials have to be stocked for each size of meter, for a reason that will be explained later. The real work centers around the making of the thermometer tube and the assembly of the instrument.

The thermometer tube is made from two sizes of glass tubing. The part which appears in the finished meter is a heavy section with a magnifying effect and a fine hole, while the bulb is a piece of plain tube. The volume of the bulb has to be in proper proportion to the size of the small hole in the magnifying portion and the latter varies quite considerably. Thus the first operation, after cutting the tube into lengths, is to gage the size of the hole and to select the cut lengths into a dozen usable sizes, rejecting all over the largest and under the smallest.

Sorting Tubes by Bore

The method of testing the size of the hole is to measure the volume of a length of it by filling with a liquid. The exact process differs for the tube used in the large or standard model and that employed for the small pattern. For the latter the hole in the tube being very small, it is possible to make use of the fact that capillary action will raise a liquid in a small bore a height in proportion to the size of that bore. The machine shown in Fig. 1 gages the small tubes. At the bottom of the frame there is an annular-shaped tank, containing alcohol and the lengths of tube are pushed into sockets so that their lower ends dip into the liquid. The operator sits with the helper on her right, the former removing the tube after reading the size, and the latter inserting a new tube. The frame is revolved by hand from left to right, so that the newly inserted tube makes a complete circuit in going from the helper to the operator, this giving it time to fill to its highest level by capillary action. On the stand, immediately in front of the operator is a lever which rotates a scale and also lifts a pointer. The pointer is raised to level up with the liquid in the tube and the number then appearing on the scale indicates into which compartment of the selected stock box the tube should go.

For the larger size tube, and the tubing from which the bulbs are made, capillary action is no use, as the bore is too big. Thus the volume is measured by mercury. On the vertical board shown in Fig. 2 is a bulb and tube containing a fixed quantity of mercury. This is connected at the bottom to a cross pipe with two stopcocks. One of these allows the mercury to be discharged to the right, and the other allows mercury from a main supply to be let in to replace the quantity discharged. This allows a fixed amount to be discharged repeatedly.

The length of tube to be tested is laid on its side, at a slight

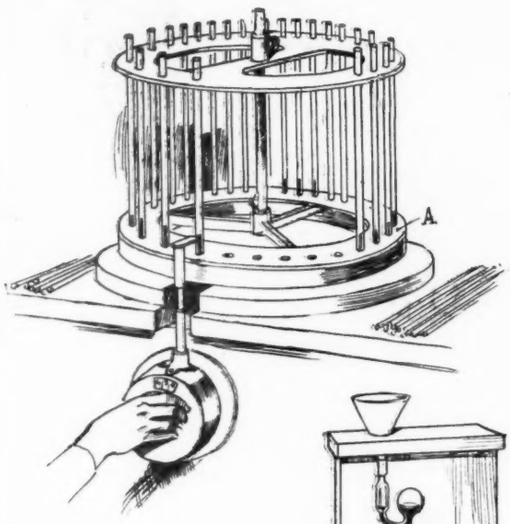


Fig. 1—Sorting tubes by means of an instrument which indicates the diameter of the bore by the height to which a column of alcohol rises through capillary attraction

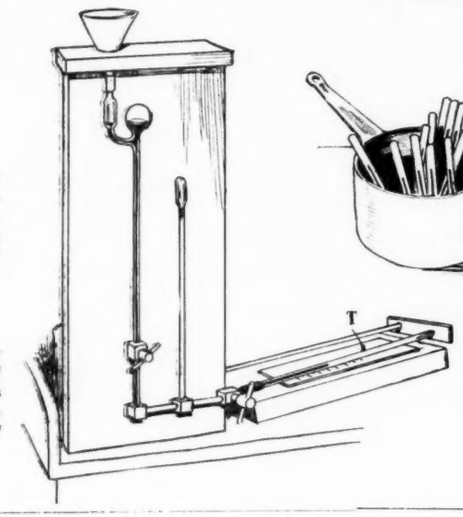


Fig. 2—Another device for measuring the diameter of the bore of the larger tubes by noting the length taken up by a given quantity of mercury

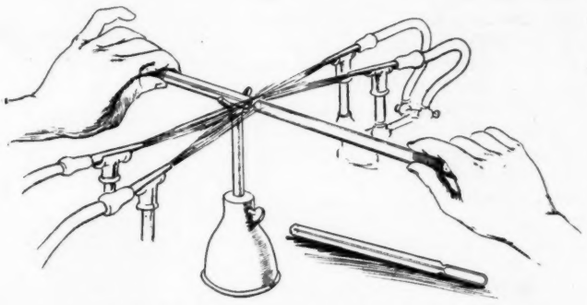


Fig. 3—Making and attaching the bulb to the tube. The bulb is brought to its required volume by blowing and its length standardized by a gage

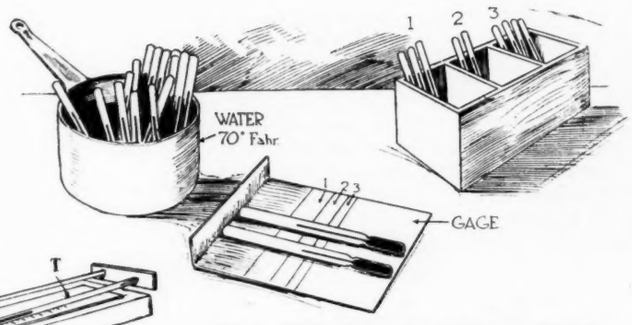


Fig. 4—After filling, the tubes are placed in a bath which is kept at a constant temperature of 70 deg. Fahrenheit and sorted into classes according to the height to which the column of fluid rises

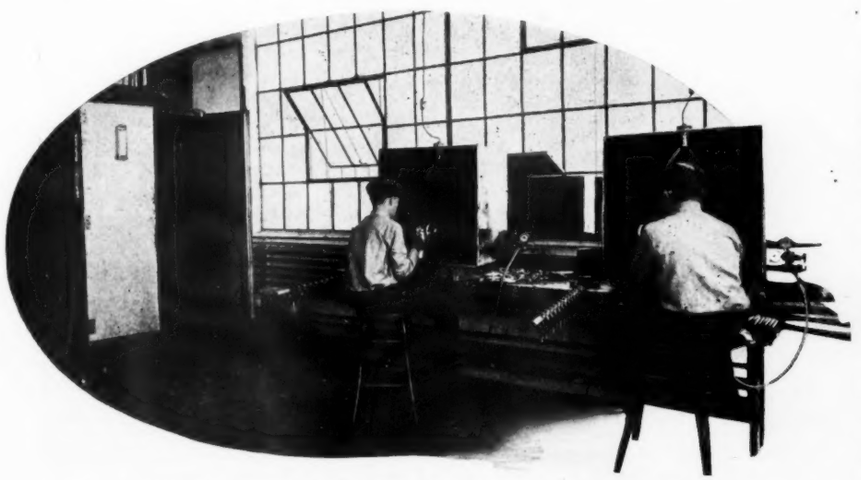
angle to the horizontal, where it rests on a scale. Its left end is pushed into a socket adjacent to the discharge cock, so that when the cock is opened the mercury is forced up the tube.

The operator first opens the main cock and then opens the discharge one. Mercury rises in the tube, and when the zero mark on the scale is reached both cocks are closed. If the zero registration is correct the discharge cock is immediately opened again, letting in the measured quantity of mercury and so gaging the tube, by showing the length filled by the measured quantity. This process is performed rapidly, being in reality much easier than it sounds, but it needs some skill. Upon the girls who perform this gaging much depends, because the selection of the tubes is the most essential item in manufacture. A mistake in selection will mean the manufacture of an incorrect instrument and much wasted labor. Thus the gaging process is not hurried, the operators working at an easy speed.

Having obtained lots of tubes in about a dozen sizes, each size has to be fitted with a bulb of requisite dimensions. The tubing from which the bulb is made having been calibrated as described, variations in volume can be obtained by varying the length. No. 1 gage capillary tube will have one length of bulb attached to it, No. 2 a different length and so on.

It is the attaching of the bulbs and bringing them to the proper size which call for the greatest skill. It is a hand and eye process entirely. The girls who do this work sit at long benches, each having in front of her a gas blowpipe with horizontally opposed jets so that the tube is heated from both sides at once. The capillary tube is held in the left hand, a length of bulb tubing in the right. First the thick wall tube is heated, the end coming to redness very quickly, and the bulb tube is then brought into the flames and welded to the thick tube. An instant in the air cools the junction, and the flame is then brought to bear on a point further along the bulb tube, where the operator judges by eye that the end should come. A few twists seals the tube and separates the remaining portion.

The length of bulb is then gaged

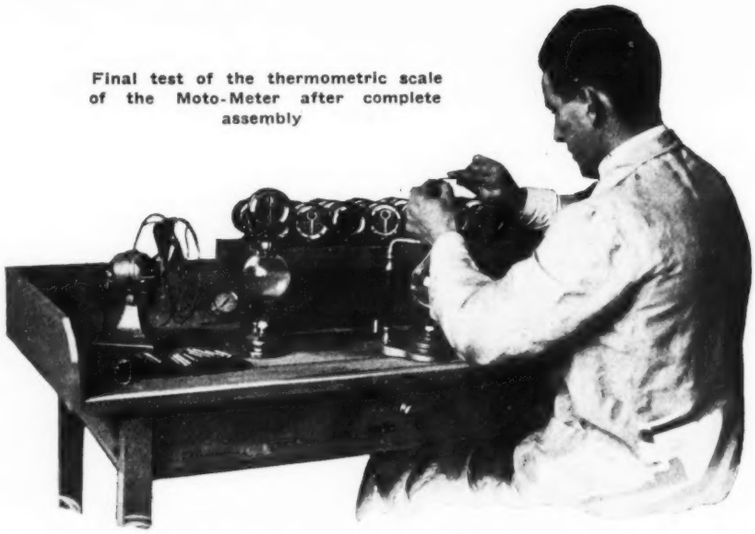


Spraying enamel on the Moto-Meter frame. The large baking oven is shown at the left

with a fixed caliper. If the bulb is too short the end is heated and the operator then blows gently down the open end of the capillary tube, expanding the bulb to length. Something like 1/16-in. can be added this way, but the operators appear to be able to judge by eye so closely that such correction is seldom necessary.

Filling with liquid is the next stage, and this is done by twice boiling the tubes immersed in the colored fluid.

Now the finished tube has to be filled with a small free space above the liquid, so some put in in the filling process has to be ejected. For this process the tubes are placed in a steam bath, which will have a constant temperature of 212 deg., and a neat point is that almost the whole tube is thus immersed in steam. The effect of heating both the bulb and the capillary tube is to expand the liquid more than if the bulb only was in the steam bath, so that after the treatment putting the bulb in steam will not cause the liquid to fill the tube completely, but will leave a little air space. The next process is to seal the ends.



Final test of the thermometric scale of the Moto-Meter after complete assembly

Despite the care taken in selecting the tubes and fitting each size with the proper dimension of bulb, there is always a little variation, but one thing does not vary. This is the height of the column when the bulb is in a steam bath. The "boiling out" process with part of the tube as well as the bulb in steam is so accurate that the distance from the top of the tube to the top of the column with the *bulb only* in steam is a constant. What may vary is the distance the liquid will drop as it cools.

To check this up the bulbs are put in a water bath kept at 70 deg. and are taken from this and gaged by comparison with a scale, being finally selected into three sizes. For each of these a suitable scale must be used in the finished meter, so three different scales have to be stocked.

This gaging done, the tubes are washed and are ready to be assembled, after the white line has been painted up the back of the tube, this being to assist the magnifying effect by reflecting light through the liquid.

Assembly of Parts

The main parts to be assembled are the frame, which is die cast and plated or enameled, two glasses and one back plate which has the scale on its inner side and the device, name plate, etc., on the other side. The back plate and the back glass are put on before the tube is inserted.

The tube is fixed in place with cement, which surrounds it just above the bulb, and the method used for adjusting the tube into position is very ingenious. A small rubber band of the ordinary office variety is given a double twist around the glass, and the latter is then pushed into the frame. The rubber holds it because it just fills the space between the tube and the socket of the frame. A little scratch made on the glass at the time of gaging is brought into register with the boiling point on the scale, and the partially assembled unit is then put in a hole in a big circular rack.

Rubber Band Seals Space

Cement is then poured in around the tube and here comes in the second function of the rubber band, for it seals the space between tube and frame and so holds the cement while the latter sets. The meter makes two circuits of the frames before being removed, as the cement has to be put in in two instalments to obtain the best adhesion.

After this process the second glass is put on and the bulb protector, the washers and securing nut attached, when it is ready for final inspection and packing.

There have been some petty manufacturing problems to solve. One was to get untarnishable bright parts and it was finally discovered that aluminum was the best material for the scale. The rings which hold the glasses in place are nickel plated copper. Another trouble was clouding of the interior of the glass, and all sorts of packing washers were tried. At last paraffin-treated paper was tried and proved the right material. The first time the meter warms up the wax softens and, the glass, etc., all being at the same temperature as the washer, the wax adheres and never lets go again.

Interior view of the Boyce Moto-Meter factory at Long Island City

War Reveals Defects in Design

Part III

Must Mount Twin Pneumatics Close Together—Should Provide Seating for Jack—Design of Driver's Cab Important—Four-Speed Gearboxes Essential — Possible Uniform Features

By W. F. Bradley

EDITOR'S NOTE—In this article Mr. Bradley, special correspondent of THE AUTOMOBILE with the allied armies, outlines in detail the chief troubles and defects brought out by war in the design of cars and trucks in the Italian service. During his work of several months as an ambulance driver, Mr. Bradley was in daily contact with army vehicles and the men handling them, so his knowledge of the subject is at once accurate and comprehensive.

WHEN twin pneumatic tires are used it is important that the two rims be set as close together as possible, leaving just sufficient clearance between the walls of the tires to prevent chafing. The reason is that at the front roads are repaired by dumping down stone and leaving the vehicles to roll it in. These stones are picked up by the twin tires, wedge themselves in between the two rims and cut the walls of the tires: In some parts of the front, round stones from the river beds are used for road-making. These are not very injurious. At other points, granite blocks from wrecked villages are broken up and laid on the road. These stones are rough, have sharp edges, and are quite capable of cutting through the walls of both tires. This trouble is a really serious one, for at some portions of the front every car returning from a run of 40 kilometers had an average of three stones in its wheels. Sometimes these stones were so tightly wedged that they could not be removed with a crowbar and hammer; it was necessary to demount the wheels or rims. By putting the rims closer together only the smaller and less destructive stones could find a lodging place.

Steel Disk Wheels Satisfactory

None of the American ambulances on the Italian front had demountable steel disk wheels. Some of them had been fitted in England with the Challiner patent demountable rims (twin rear). These were very unsatisfactory, and decidedly inferior to the steel disk demountable wheel. To take off the inner tire it was necessary to remove twenty-four nuts of 10 mm. diameter, compared with either 5, 6 or 10 of 18 mm. diameter on the steel disk type.

To prevent creeping on the Challiner a steel plate with three holes was riveted to each of the fixed rims, and through these holes were passed the valve stem and a couple of pegs projecting from the demountable rim. As water always found its way in between the two surfaces, the rims were always in a more or less rusted condition, and it was no uncommon occurrence for both pegs to break off, leaving only the valve stem to act as a stop against creeping. This was soon sawn through, and the tire of course went flat. The trouble was partially overcome by brazing the pegs in, instead of riveting them, but even then there was a very small margin of safety. In some cases, too, the plate secured to the fixed rim would come adrift, and to replace it necessitated taking off the entire wheel. On the Challiner type the length between the demountable rim and the fixed rim is so great that the standard European valve stem will not come through; thus, in order to inflate the tires it is necessary to take off the rims—eight nuts and a flange for each front and outer rear tire; twenty-four nuts and three flanges for each inner rear tire. The consequence was that with these wheels tires were always run under-inflated. Unless ordered to do so, or time was hanging very heavy on his hands, no driver would take his rims off to test air pressure. With the steel disk type the valves of both outside and inside wheels were more accessible than on the ordinary fixed wood artillery wheel.

The most unsatisfactory job on an army car is not changing rims or wheels, but is the jacking up of the automobile. Except under very exceptional circumstances tires are not changed on the road side, for it is rarely that pneumatic tired trucks make individual trips of more than 60 miles, and with two spares (either rims or wheels) there is sufficient margin against tire trouble. In most sections the drivers are not allowed to carry a spare tube, so that if they have more than two punctures they are reduced to putting on a patch, coming home on the rim, or with a single tire on one of the twin rear wheels. There are plenty of good jacks on the market, but the writer has never yet found a jack made for the car on which it was going to be used, nor has he seen a car designed with a special seating to receive a jack.

Picture the following scenes, and perhaps it will help to drive home the necessity for a better system of jacking than that now prevailing. Midnight, summer time, a big battle raging 5 miles in the rear, roads thick with dust and heavy with ammunition wagons and reserve troops hurrying to the front. The ambulance is loaded with thirteen wounded; it is designed to carry eight, but the dressing station attendants refuse to believe it. One of the single back tires has burst, and after crawling on his hands and knees under the car, the driver finds that there is only a bolt head to receive the jack, and that it is impossible for him to lift the car with the heavy load aboard. Some of the men cannot walk; others are so tired that they will not get out.

Jack Trouble Under Fire

Or this scene: Winter time, roads heavy with mud as the result of 15 days constant rain and much traffic. On the approach to the one-way bridge a front tire goes, and the driver finds, as is always the case, that the jack will not lower sufficiently to go under the axle when the tire is deflated. The only way is to pull out the floorboards, run the punctured wheel on them and then use the jack. While this is being done the enemy

begins to put in the 20 double effect shells (shrapnel and high explosives combined) which are reserved daily for this bridge head. The soldiers working in the neighborhood disappear as if by magic as soon as the whizz of the first shell is heard, for they know by experience how many will follow. The two military police on duty at the bridge head drop into their sand-bagged dug-out; then a head emerges cautiously and a voice asks why the driver cannot get away quicker. Only the men inside are silent; they have had their visitation and are not afraid of anything worse. These are not imaginary cases; they are taken from life, and are a few of hundreds.

It seems almost elementary common sense that the car manufacturer should design his car to receive a jack and supply a jack to fit the car. In most cases a jack which will go under the front axle is not high enough for the rear axle. Generally there is a satisfactory place for the jack under the front spring seating; but at the rear, if the axle has a truss rod, there is no place for the jack other than a bolt head. Further, most of the jacks supplied to the army will not lift a vehicle carrying a 1½-ton load. Why is it not possible for the heavier pneumatic-tired vehicles to be fitted with a permanent jack allowing the car to be raised without any manual effort in much the same way as a motorcyclist raises his machine? There are no great mechanical difficulties in the way, and the matter is certainly worthy of attention. Most army drivers would prefer an accessory of this nature to a power tire pump, or a starter.

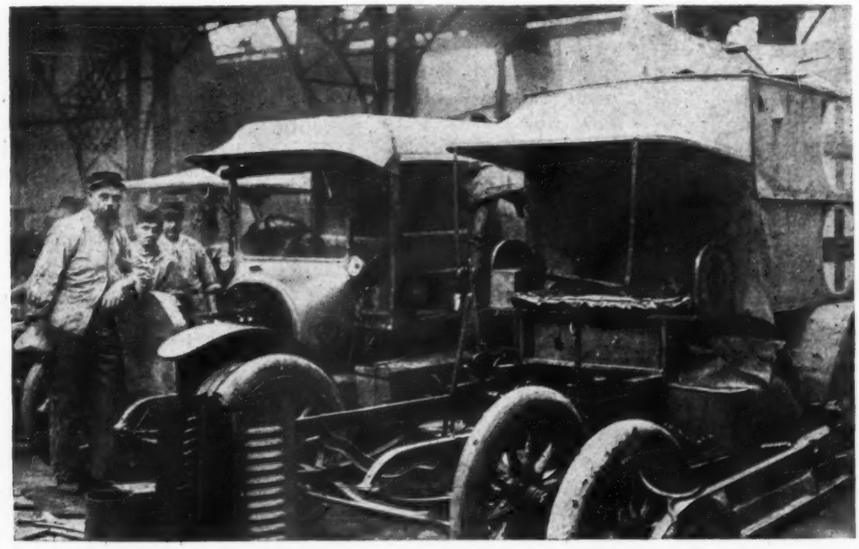
Lack of Attention to Drivers' Comfort

Not enough attention is paid to the material comfort of drivers of army trucks and cars. The limiting factor in the usefulness of a car is not any of its mechanical organs, but the man at the wheel. No matter how elaborate the preliminary preparations, the outbreak of a battle makes it necessary for men to work to the limit. Whether their limit will be 10, 12, 16, 24, or 36 hr. at the wheel depends largely on the care given to the driver's comfort and to the ease of control. It is certain that the car will not fail if it is run twice 36 hr. without a break. Why should a spring cushioned and horsehair seat be necessary for a well-sprung touring car, and a thin springless cushion be sufficient for the driver of a truck? Why should the emergency brake lever be convenient to the hand of the touring car driver and so inaccessible on the truck that the driver has to bend until his nose is on the steering wheel before he can reach it. Why should the touring car have the protection of side doors, scuttle dash and a windscreen, and the man on a fast truck or ambulance be left out in the open?

Folding Top Over Driver Desirable

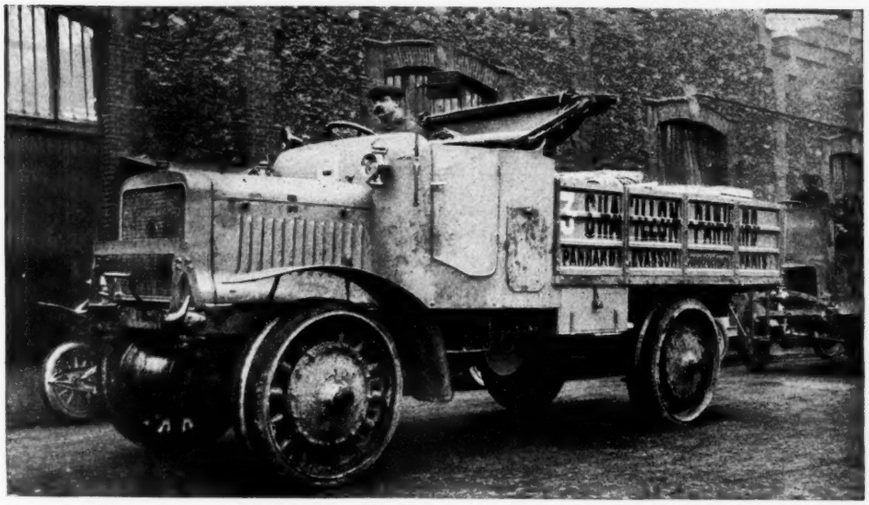
For the truck driver there should be a folding top quite independent of the top over the body. This also applies to ambulances. The writer has a decided objection to fixed extensions over the driver's head. To be of real use against rain the top should be low and pass a little distance ahead of the dash. But such a top makes night driving without lights very difficult indeed. Every driver who has had experience with this class of work will admit that he would rather be soaked in rain than have to drive at night over a dangerous road with a low and deep top. An almost completely inclosed cab should be provided for every army driver at the front. This means a fairly high dash, side doors, preferably easily removed, a folding top and a leather apron screwed to the top edge of the dash and hooked to the under side of the top, about level with the driver's chin. The English, with their great love of personal comfort, have built most of their drivers' cabs in this way. The only disadvantage of their design is the fixed top, but it is probable that the men responsible for the design had not had much experience with night driving on unlit roads. A minor point is that the top should be secured to rather stout steel uprights from the dash and not by means of straps of wire cables. The reason for this is that on many portions of the front the roads are shut off from the enemy's view by means of screens right across the road, just sufficiently high to clear the tops of trucks. In stormy weather these screens are liable to be destroyed and the wire to which they were attached will sag until they are about level with a driver's neck. There have been some accidents and many narrow escapes from this, and although the uprights would not be sufficiently strong to break the wire, they would tend to throw it upward, clear of the driver's head.

The Italians have not paid all the attention which could be desired to the comfort of drivers. The regulation truck has a folding top with side curtains, quite independent of the truck body—which is the correct practice—but has no side doors, nor a leather or canvas waterproof apron from the top of the dash. On the ambulances the roof is extended over the driver's head, and is sufficiently high not to interfere very much with night driving. However, it admits an extraordinary amount of rain. In consequence, drivers have displayed a considerable amount of ingenuity in making their quarters more comfortable. Window frames have been taken out of wrecked houses, and, after glass had been fitted, were erected above the dash. Side curtains would be secured so as to completely shut in the sides of the car, and one of the floor boards removed to give the driver the benefit of the hot air from the motor.



Red Cross ambulances brought back for repairs after months of severe service on the Italian front

Little if any gearbox trouble was experienced in service on the front. Not a single case can be recalled of a gearset on an American car having failed under the most strenuous work. These gears, however, were noisy, and changing down was most difficult. Probably in private service this would not be apparent, for even on the good roads some distance to the rear drivers would very quickly pass into top, and rarely had any need to change down unless the vehicle had previously been brought to a dead stop. On the hilly and muddy roads near the front a lot more low-gear work had to be done than the designer had ever imagined, and changes down had to be made while the vehicle was in motion. Even the most experienced drivers failed to do this silently. Further, the cars absolutely shrieked when running on second gear. At some points this was a real disadvantage, for the road was so near the enemy's lines that the howl of the gears could be heard, and the cars would be fired at on reaching exposed points. The distance was judged not by sight but by sound. Passing from second to first gear was so difficult that some drivers would stop entirely rather than attempt the change while the car was in motion. The final gear reduction of these cars was 6 to 1, which necessitated the use of bottom gear for comparatively long periods when roads were heavy. One of the engineers recommended to headquarters that the final reduction should be 8-1. This was not done because the bottom gear was too high, but in order to avoid the difficult change across the gate from second to first, on some of the winding hills. It was calculated that with the lower final gear ratio men could keep on second, only using first for getting away from a standing start.



The type of driver's cab on this Chatillon-Panhard truck has been found very satisfactory in war service on the Italian front

Two Types of Clutches Chiefly Used

Two main types of clutches were employed: leather cone and multiple disk running in oil or dry. Correctly designed there was not very much to choose between the two. The cone types were apt to be fierce unless treated occasionally with oil, and most of the multiple disk had to be washed out and filled with fresh oil on an average once a week. Some of the supposedly dry type only ran well treated with a thin oil, or better a mixture of oil and kerosene. The phosphor-bronze U-shape clutch withdrawal rings on some U. S. A. vehicles required constant lubrication and were in danger of being neglected by drivers; also the clutch coupling had to be attended to at rather frequent intervals to avoid trouble.

One American truck was originally designed to use single wheels on the rear, and where single wheels have been used no real axle trouble appears to have developed. But a number of these cars have been sent to the front for ambulance work with twin rear wheels, and with this change there have been several cases of axle failure. The differential shaft tapers are certainly too small for the extra strain of twin wheels, for there have been several cases of the shaft breaking just back of the taper. In some cases this was provoked by neglect to keep the rear wheel hub tight on its taper. When not driven home sufficiently in the first instance, a certain amount of play set up and the keyway was "chewed up." Even if the shaft did not break, the keyway had to be trued up and a new key fitted. All the Fiats have double keyways, at 18 deg., and developed no weakness under this heading.

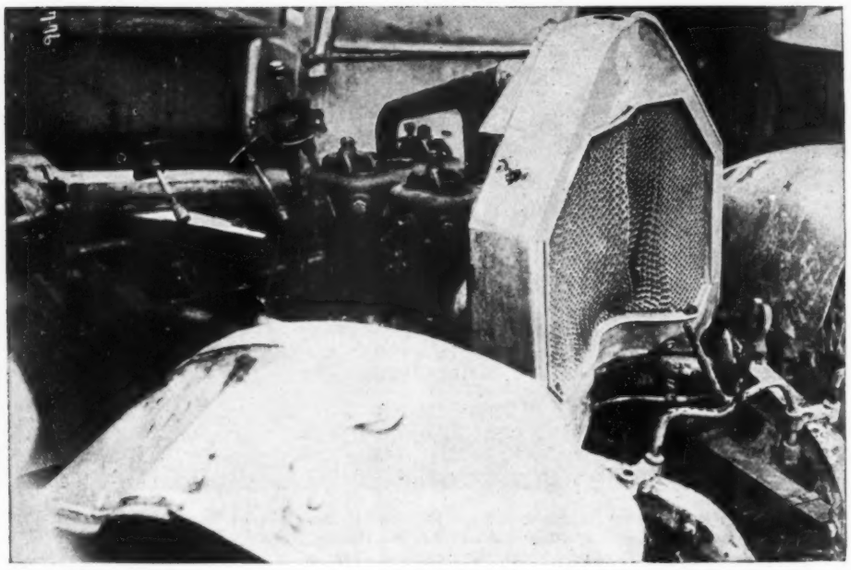
Unit construction of motor and gearbox does not show up very satisfactorily under the heading of repair facilities on war service. There is a lot to be said in favor of the system from a factory standpoint, and not very much against it for peace service. But on war work every motor has to come right out of the chassis once in 12 months on an average, while gearboxes will last three times that period without attention. One section, which is quite typical, has a record of sixty-five complete motor overhauls and not a single transmission repair. Much of this work has to be done in the open air, or under very flimsy covering, and the task is very much complicated if the transmission has to be taken out with the motor. The dash has to be taken away; sometimes the body must be removed; all electric light connections must be broken and usually a block and tackle are indispensable. Many a motor overhaul has been carried out by a couple of men, who for ease of handling took the cylinders off first and lifted the crankcase out afterwards, but it is very doubtful if they could have done the job under war conditions if the transmission had had to come away at the same time.

Where Uniformity Is Possible

It cannot be maintained that war experience has proved the necessity of uniform design of automobile trucks. Indeed, if truck experience is linked up with aviation motor experience, the evidence is strongly in favor of giving manufacturers the greatest possible liberty; in other words, specifications should deal with ends, not with means. Any other policy is bound to have a stifling influence on the development of design.

The main points on which uniformity can be insisted are four-cylinder motors, not less than three main bearings, magneto bases and couplings, carbureter flanges, four-speed gearsets, body dimensions, and particularly body height, clearance, metal wheels—either cast steel or steel disk—and greater uniformity in tire sizes.

In the Italian army the 3½-ton truck, which forms the backbone of the automobile service, has a four-cylinder motor averaging 319.8 cu. in. piston displacement. This is the average of the five leading makes of trucks, and compares with 365.7 cu. in. average for 22 American



Belsize car which struck a tree on the Italian front while traveling at high speed

trucks carrying 7000 lb. load. It is to be noted, however, that while the great majority of these American trucks have three-speed gearsets, the Italians invariably have four. For conditions on the Italian front a lower number of speeds would certainly be disadvantageous. The average bore-stroke ratio on the Italian trucks is 1 to 1.73, the highest being 1 to 2 and the lowest 1 to 1.47. The average for 22 American trucks of similar load capacity is 1 to 1.28.

While the trucks, on the whole, have been quite capable of doing the work required of them with the loads they were designed to carry, the tendency of war service has been to create a feeling in favor of slightly larger motors. Trucks of 3½-ton capacity with 340 cu. in. motors have been able to face all conditions, but some of less than 300 cu. in. have revealed themselves as slightly underpowered for strenuous war service. European conditions in general, and the high cost of gasoline in particular, have tended toward the smallest possible motor capable of doing the work under average conditions. This tendency, in some cases, has been carried too far.

There is nothing to prove that circulatory lubrication is better than any other system. On the Italian front, full pressure and circulating with troughs worked side by side. There was more trouble with the latter than with the former, but this was not due to the system itself, but to details in the bearings and inadequate filtering. It is not sufficiently realized that on war service drivers have to take any oil available, and it may vary from thin Ford oil to gearset lubricant. Not enough attention is usually paid to ignition wiring to prevent chafing and to keep out wet.

Dust an Engine Problem

Extremes of wet and dust make Italian conditions similar to those often encountered in America, and more provision should be made to keep this dust out of the carbureter and the crankcase breather. It is difficult to abolish engine shields, particularly if the engine is mounted on a flexible sub-frame. It is not difficult, however, to design an engine shield which can be let down and put back as easily as opening and closing a door. It is surprising that some shields should be so good and some so bad. If the crankcase has cast webs it is absolutely essential that the flywheel be completely inclosed, and an adequate shield for this and the gearset is apt to be much more complicated than full shielding.

Interchangeability of radiators would be a very good feature, but it is difficult to see how it could be carried out while engine design varies so much and no two engines require the same amount of cooling area. To make this provision really effective, water passages, valve area, port area and exhaust manifold would all have to be studied and rendered more or less uniform. It would certainly be advisable to abolish the belt and make the fan gear-driven, as is now done by Spa. A radiator guard is absolutely essential. Front fenders suffer more than radiators from minor collisions. They should be attached by two stout brackets to main frame members and be entirely independent of the running boards. A uniform type of fender and mounting could easily be arranged.

Four-speed gearsets are essential for army service under varied conditions. In order to obtain a symmetrical layout of the gearset Spa has abolished direct drive on all its trucks and has reduced annular ball bearings in the transmission to two types and one type of thrust bearing. Also all joints are lapped. This is an important matter from the standpoint of the repair departments, and deserves to receive very close attention.

Details of Italian Type Axle

Practically all the Italian shaft-driven models have a two-piece stamping for rear axle and propeller shaft housing, these two halves—upper and lower—being bolted together. A yoke is mounted on the forward end of the housing, and there is but one universal joint in the system, this being in a separate metal housing just back of the gearbox. In service, this type of axle has stood up very well. From a repairshop standpoint, with few facilities available, there is the disadvantage that before any work can be done the entire axle and propeller shaft must be taken down. This in itself is a simple job, but when the unit is out a big series of bolts must be withdrawn to take the two halves of the housing apart, and the replacing of this unit is rather a delicate matter. This, of course, applies to work done in temporary repairshops at the front; with factory assembly the job is simple. Every make of axle having Hotchkiss drive could be demounted and assembled much more rapidly than the Italian type. Hotchkiss drive is not used in Italy to any appreciable extent, but the few foreign cars and light trucks working there with this system were satisfactory. There is no reason why Hotchkiss drive should be taboo on principle.

Inclosed chain drive is in such an immense majority on the Italian front that it is difficult to make comparisons. There are no worm-driven axles in service in Italy. One foreign make of double reduction axle gave endless trouble, and the trucks could never be loaded to their full capacity. The same happened to these trucks on another front. It would not be just to blame the system, however, for it was obvious that there were many defects of material and design in this particular make.

In truck specification more attention should be paid to a uniform turning radius. This is important on all fronts, but particularly so under the mountain condi-

tions of Italy. As an instance, convoys using two U. S. A. machines had to be kept separate, for the latter could not tackle hairpin turns which were negotiable by the former. Trucks working at the front are constantly obliged to turn on narrow and rough-surfaced roads. An inadequate lock causes much delay, and even one truck can hold up an entire convoy. Steering knuckle tie rod should certainly be located behind the front axle.

Cast-steel wheels have proved their worth. There is easily room for more uniformity in tires. The usual size on Italian service for 3½-ton trucks is 900 by 120 twin, or 35.4 by 4.7 in., an alternative being 50 in. by 5.5 twin. In some cases, very small diameter wheels have been adopted as the quickest and easiest way of getting a low-gear ratio when work has to be done on steep hills with good surfaces. From a tire standpoint this plan is not very satisfactory.

Practically the standard wheelbase on Italian 3½-ton trucks is 11 ft. 9 in., with an available body length of 156 in., measuring from the inside of the dashboard. Oil lamps and a single acetylene headlight on the dash are adequate and simple. It is folly to put a headlight out in front of the radiator for war service. Pressure-fed gasoline gives trouble on war service, no matter how well the system is installed. When pressure feed is used an auxiliary hand-pressure pump on the dash is indispensable. Dash should be metal, not wood. Driver's top must be independent of top over body of truck. A road sprag is essential. Towing hooks should be fitted to all four corners of chassis, both trucks and ambulances. Bolts are preferable to rivets for attaching towing hooks. As a result of war service, some makers are now bolting their frames together instead of riveting them. Ambulances without towing hooks often have their rear cross frame member bent by using it for towing.

Indispensable Tool Equipment

Tool equipment should comprise a set of wrenches to fit all nuts on truck—magneto wrench, two screwdrivers, pair of pliers, valve-lifting tool, carbureter nozzle wrench, two files, grease gun, oil can, a powerful bottle jack, can of soft grease, 1 gal. of engine oil (minimum), a wood lever armed with sheet steel, not less than 6 ft. long, and a spade. These two latter items are indispensable for getting a bogged truck onto the road.

Theoretically, every truck going on war service should carry a liberal supply of spares, comprising valves, plugs, nuts, cotter pins, washers, electric cable, carbureter float, etc. In practice, to give these out to every driver would be equivalent to throwing money away. No matter how severe the discipline and how good the organization, drivers will not take care of spare parts. When a part has been lost the recognized practice is to borrow that part from the next car during the driver's absence. Drivers are continually complaining that radiator caps, hub caps, greasers, oil cans and tools are stolen by other men who have lost these articles. The only practical system is to give each driver the necessary tools, and place all spares in charge of a mechanic, who will give them out as required. If the trucks are working from a fixed base, the parts will be kept at that base. If the trucks are constantly on the move, then the spares should be placed in charge of a sergeant or corporal. One set of spares for six cars is quite a sufficient proportion.

Manufacturers' Merchandising

Waste in Buying Pressed Steel Work

AUTOMOBILE manufacturers are recognized as among the most up to date in the country as regards purchase of materials, parts and supplies, but there are some branches of their purchasing work which could be made much more efficient. One of these is the purchase of pressed steel work. A prominent manufacturer of pressed steel work, whose business is largely with automobile manufacturers, states that they do not buy their pressed steel work with the intelligence which characterizes their other purchases. Some of the ways in which they curtail their purchasing efficiency with a corresponding influence on production are as follows:

They specify materials not really needed which represent considerable additional expense. For example, they specify cold rolled steel when hot rolled steel would do just as well. This refers largely to parts which are to be finished later with paint or enamel or else are not exposed.

Manufacturers should consult with the pressed steel company engineers to be sure that they are buying material which will meet their requirements without wasting money on better quality products than are really necessary.

Cold-rolled sheet steel would frequently do just as well as cold-rolled strip steel specified by some makers, and would represent a marked saving even on a small output.

Pressed steel manufacturers often receive specifications and blueprints containing limits for stampings which are impracticable without machining. An example of this is one case where a car builder wanted a certain piece drawn and formed within a limit of plus or minus 0.001 in., which is not commercially practicable. This sort of thing necessitates more or less extensive changes in design with a consequent loss of time and money.

Another common fault is that automobile manufacturers sometimes furnish pressed steel concerns with specifications and blueprints designed for castings and forgings and expect the pressed steel makers to redesign the parts or articles and furnish quotations on stampings. In these cases the entire matter has to be returned to the car builder for the proper designs.

Companies having a small output do not use pressed steel work to nearly the extent they could. Closer study of economical manufacturing methods is having a beneficial effect on this situation, however, according to the pressed steel people, who acknowledge that automobile makers are much more practical than formerly when submitting designs for quotations in giving an idea of the approximate volume desired. There is room for improvement, however, even in this particular and reticence on the part of the car maker causes uncertainty in the mind of the pressed steel manufacturer with the result that his quotations are not nearly as satisfactory to either party as when he is given a definite basis on which to develop them.

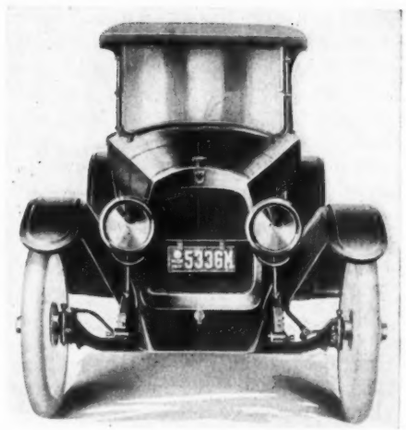
Boat Lines in Hackett Roadster

Patented Door Permits Direct Entrance to Front and Rear Seats

A NEW roadster, incorporating a number of new body features, has been brought out by the Hackett Motor Car Co., Jackson, Mich. The body is particularly noticeable for its boatlike lines and the fact that the top side line of the body is a well-defined curved line extending from front to rear, and convex in relation to the ground.

One of the important features of the new roadster is a patented door which allows a direct entrance to both the front and rear seats, eliminating the necessity for passing between the divided front seats. The illustrations indicate the door construction on this car clearly.

The entrance to the front seat is 7½ in. wide at the narrowest point, and the passageway to the rear is 10 in. wide. The total door width is 29 in. and 7 in. of the front seat swings open with the door. When the door is open the width of the seat is 34 in., leaving plenty of room for two passengers to sit before the door is closed, and when it is shut the cushions fit closely together, the division in the seat appearing as a pleat in the upholstery. The door may be either opened from the front or the rear, both door handles opening on the same shaft. As a double precaution there is a safety lock in addition to the regular lock. This safety lock can be put on by pulling back either the front or rear door handle. The door is hung on two heavy, hidden coupé hinges and runs in a track, so that it cannot get out of position. This track also acts as a support when the door is closed and checks the swing when it is opened.

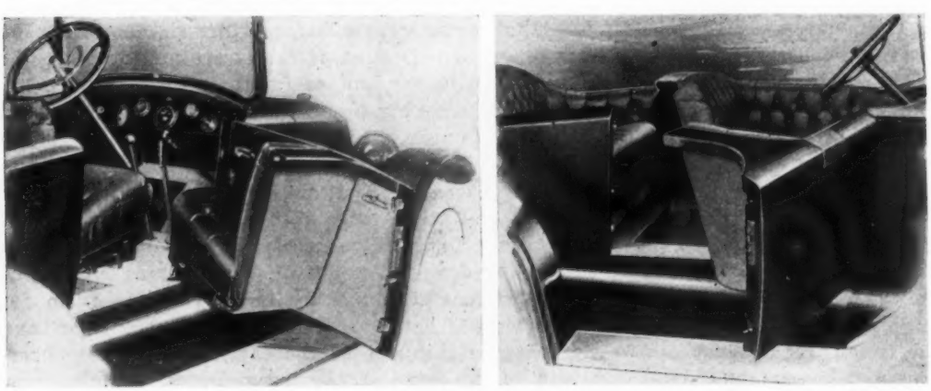


Hackett roadster, showing sharp, angular fenders and speed boat lines and decks

The roadster body is mounted on the same chassis as the Hackett touring car, having a Golden, Belknap & Swartz engine and clutch, Grant-Lees gearbox, Walker-Weiss axles, with semi-floating rear, Hotchkiss drive, Foster steering gear, Connecticut ignition, Carter carbureter and gravity tank, and Dyneto 2-unit starting and lighting system.

The car sells for $888 f.o.b. Jackson, Mich., with wire wheels $90 additional. The wheelbase is 112 in.

Side view of new Hackett roadster, showing sharp body lines. Hood and cowl lengths total 45 in.



Patented door on new Hackett roadster, showing (at the left) the 7½-in. entrance to front seat. The other view shows the 10-in. passageway to rear. Note how leg room is secured by cutting a pit in the back of the front seat

Lima-Indiana Gasoline Output 8½% Lower

STATISTICS compiled by J. D. Northrop, of the United States Geological Survey, show that in 1916 the output of petroleum in the Lima-Indiana field, which includes the areas of oil production in northwestern Ohio and in Indiana, amounted to 3,905,003 bbl. This quantity is less by 364,588 bbl., or 8½ per cent, than the output in 1915, and shows a continuation of the steady decline in the production of this field since it attained its maximum output in 1904. The total value of the 1916 output was $6,117,269.

The average price received for this oil at the wells was $1.57 a barrel, a gain of 61 cents, or 65 per cent, compared with the average price in 1915. As a consequence the total market value of the output in 1916 exceeded the value of the larger output in 1915 by $2,003,041, or 49 per cent.

The stimulus to field activity provided by the more favorable market for oil in 1916 resulted in the completion of 965 new wells in the Lima-Indiana field in that year, compared with 453 in 1915.

In the Indiana division, which includes all areas of oil production in this State, field activity was distributed over 25 counties, and resulted in the completion of 266 wells, of which 160 produced oil, 8 gas only, and 98 were dry.

In 1916 there were abandoned in Indiana 517 exhausted oil wells.

S. A. E. Standards in Development

Many Progress Reports Accepted by Cleveland Meeting of S. A. E. Standards Committee in Addition to New Standards Accepted

LAST week THE AUTOMOBILE published the reports of all the new standards accepted at the Cleveland meeting of the standards committee of the Society of Automotive Engineers with the exception of that of the research division. This will be dealt with later, as THE AUTOMOBILE is about to conduct some tests of a few cars using the new apparatus. Herewith follows the discussion of the report of the springs division, given last week, and sundry progress reports.

Amend Army Specifications

The discussion on the report of the springs division was focused on the central idea of the necessity of allowing the spring manufacturer a certain latitude in which to carry out his design.

Another point brought up dealt with the Brinnell hardness specification. In bringing up this point H. R. McMahon, president of the Standard Steel Spring Co., stated that paragraph 259 of the report calling for certain Brinnell tests is on the hard side. He believes that the best results would be obtained by Brinnell figures somewhat on the soft side, with the particular alloy steels necessary for springs.

C. W. McKinley stated that the tabulation was prepared as the result of 1700 tests, and that as a result of these it clearly showed that with an elastic limit of 175,000 and an elongation of 50 per cent in 8 in., a drop below 390 Brinnell gives a lower elastic limit.

McMahon stated that the report does not definitely mention the type of tests to be used, and suggested that the standard pull test be specified so that it would clearly indicate that a transverse loading test is not intended. This point was answered by the statement that since ultimate strength is specified, no other than the pull test could be employed, as ultimate strengths cannot be secured with the transverse loading methods.

The debate on spring specification limits was started when W. M. Britton of the Quartermaster's Department of the Army suggested that the distance between the spring and permanent stop be included. McMahon, McKinley and Utz all pointed out that too many restricted specifications are not desirable in springs and that the clearance particularly would in all probability be variable. The discussion centered about this point, with the consensus of opinion clearly in line with Chairman Utz's view of not binding the spring manufacturer too closely with hard and fast specifications.

More Lamp Definitions

The report of the lighting division concerned itself almost wholly with nomenclature, the new terminology being agreed upon at a joint meeting with the Illuminating Engineering Society. The report follows:

It is not felt advisable at this time to take into account standardization of terminology with reference to any lighting equipment other than the electric type. It is to be understood that the following general lighting requirements are the only ones to be considered and that any other requirements do not come within the scope of this division.

1—Road lighting.

2—Signal lighting.

It is recommended that road lighting be accomplished by the use of at least two separate units, these lighting units to be referred to hereafter as "head lamps."

The terminology to be used in referring to the various component parts of each head-lamp shall be as follows:

a—The apex is that portion of the reflector to the extreme rear.

b—The rim is that portion which retains the reflector in place and which forms no part of the reflecting surface.

c—The reflecting surface is that portion of the reflector between the apex and the rim which receives and redirects rays of light.

The reflector support is the means by which the reflector is retained in a permanent position.

The lamp housing is that portion of the lighting units which forms the exterior shell or case.

The lamp door is the front cover of the lamp housing, regardless of the method of attachment.

The front glass is that portion of the lamp door through which the light is emitted.

The prop or props are that portion of the lamp housing by means of which a lighting unit is fastened to its supporting bracket.

The lamp bracket is the support on which a lighting unit is mounted by mean of its prop or props.

The lamp socket is the receptacle which receives the electric incandescent lamp base.

The lamp socket adjustment is the device for regulating the position of the lamp socket with reference to the reflector.

An electric incandescent lamp is a light source consisting of a glass bulb containing a filament electrically maintained at incandescence. A lighting unit consisting of an electric incandescent lamp with shade, reflector, inclosing globe, housing or other accessories is also commonly called a "lamp." In such cases, in order to distinguish between the assembled lighting unit and the incandescent light source within it, the latter is often called a "bulb," especially in the automobile industry.

The different portions of the electric incandescent lamp may be referred to as follows in the illustration:

The glass bulb is designated, as regards shape—"round" (G-); etc.: as regards size—the glass bulb is measured in eighths of an inch. For example, a G-12 bulb is a round or globular envelope, 12/8 in. in diameter.

The base is that portion of the electric incandescent lamp by means of which it is retained in the socket.

Lock pins are small studs projecting from the sides of the base, and serve as a part of the locking device of the bayonet socket.

The base contacts are those portions of the base by means of which electrical contact is made between the socket and the leading-in wires to the filament.

The focusing length is the distance along the axis of the base from the center of the filament field to a plane perpendicular to the axis and passing through the locating sides of the lock pins.

The filament mount is the entire portion of the electric incandescent lamp composed of filament, leading-in wires and glass stem.

The filament is the light emitting element.

The leading-in wires are that portion of the filament mount by means of which electrical connection is made between the base contacts and the filament.

The glass stem is that portion of the filament mount by means of which the leading-in wires and filament are supported.

The filament shape is the physical form of the filament.

The filament field is the cross section through the axis of a solid figure formed by the rotation of the filament about the base axis. In the case of the so-called "vacuum" type helical coil filament, if the axis of the filament itself coincides with the axis of the base, the cylinder formed by the rotation of the filament in this manner would have a rectangular cross section through its axis of a given length and breadth which would be termed "filament field." In this case the filament field would be the cross section of a cylinder inclosing the filament. In like manner, the rotation of a "V" shaped filament,

such as is used in the gas-filled type of incandescent lamp, would produce a cone whose triangular cross section through its axis of revolution would be termed "filament field."

Light refers to the luminous radiation emitted from the head-lamp and may be divided under the following sub-headings as indicated in the drawing attached:

a—Direct light is the light emitted directly from the filament and emerging from the head-lamp.

b—Stray direct light is the light unintentionally changed in direction by the reflection from bulb parts.

c—Direct reflected light is that part of the light emerging from the head-lamp which has been specularly reflected by the reflector.

d—Stray reflected light is stray direct light which has been specularly reflected by the reflector.

e—Diffused reflected light is that part of the emitted light which has been diffusely scattered by the reflector due to imperfections of reflecting surface.

The light cone is the solid angle of light emitted in the form of a cone by the head-lamp and is subdivided for reference as in the illustration.

a—The direct cone is the direct light from the incandescent lamp passing through the front glass.

b—The reflected cone is that cone of light formed by the blending of all cones which are produced by the reflected images of the filament and which cones emanate from all points of the reflector upon which light falls. The cone produced in this manner includes both stray and diffused reflected light and is all light emerging from the head-lamps and not included in the direct cone.

Progress Reports

Chairman Ehrman of the miscellaneous division reported progress. One of the points about his report is that the matter of speedometer drive has been turned over to the transmission division because of the fact that this matter properly follows under the head of matters to be discussed by them.

This division has a number of letters out for the purpose of securing data on standardized drawings, A. S. M. E. pitches, speedometer heads, etc. The question of lock washer pressures has been dropped and a request that bumper mounting be assigned to the division has been made.

Chairman Copeland made a progress report for the newly-formed transmission division, which has up to the present time only held one meeting. Some of the suggestions which are to be dealt with by this division are clutch facings, amidship control, power take-off, tire pump seats, pedal shaft locations, spline shafts, bell housing length, etc. It will be remembered that this division has been formed as a result of a separation of the engine and transmission division into two parts, one dealing with engines and the other with transmissions. The division had a long list of suggestions ahead of it and with practically a virgin field to work upon, and will probably be one of the most occupied divisions during the next few years.

Battery Post Accepted Provisionally

The starting battery division of the standards committee is on the threshold of some very important work. The question of battery interchangeability is directly linked up with the activities of this branch of standards work. The importance of the work is such that if standardization of starting batteries can result it will be of the greatest benefit not only to the car manufacturer and the battery manufacturer, but also to the car user and dealer. The manufacturer is interested because it will decrease the price of batteries and will render it possible to always secure an immediate supply. The battery manufacturer will be able to materially reduce the number of models made, which will in turn lessen the cost of manufacture and cut down the overhead made necessary by the maintenance of a large stock of various sizes of batteries. The owner will be benefited by his ability to secure a battery to fit his car at any battery service station, and the dealer will be benefited because he will not have to maintain a large supply of batteries in order to take care of the needs of his customers.

Battery service at the present time is costing enormous sums of money and forms a considerable percentage of the investment price in batteries. If the battery division of the standards committee is able to complete the program it has embarked upon, this situation will be materially relieved. Owing to the difficulties of the work, it is necessary for the division to take up one matter at a time and concentrate upon it, and for this reason the activities of this division are largely concerned at the present time with standardization of the terminals.

This report was accepted with the understanding that the council before passing the matter on to the general membership of the society would investigate certain patent conditions in connection with the tapered style of binding posts recommended.

Discussion of Battery Division Report

Some discussion followed the presentation of the report of the battery division. J. J. Aull suggested that it would be easier to translate the taper on the taper post dimensions to 1 in. in 9 in. instead of in terms of feet.

W. H. Conant of the Gould Storage Battery Co., who read the report, afterward mentioned that there were possible patent complications on account of the application for a patent on certain battery combinations, which may possibly involve the use of the tapered binding post.

W. L. Bliss of the U. S. Lighting and Heating Corp. suggested that it would probably be of advantage if the owner of the patent application would clearly state his purposes to the division. There were certain objections to this matter, however, as the Standards Committee did not wish to be put in the light of either standardizing a patented object or deliberately making a standard in order to offset the merits of a patented object, owing to which circumstances the entire matter was passed along for consideration by the council.

J. E. Schipper stated that it was particularly desirable to make a study of the container matter as soon as possible, because this would be the greatest step in permitting of battery interchangeability, to which Chairman Utz stated that the container is on the list and would have early consideration.

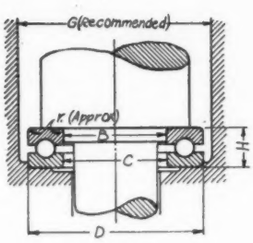
W. H. Conant also stated that the limitations of battery containers are soon to be reported, but that the terminal matter was receiving first consideration, because the longer a decision is delayed the more difficult the matter becomes. With the understanding that the council would clear up the patent matter referred to, the report was unanimously accepted.

Marine Standards Recommendations

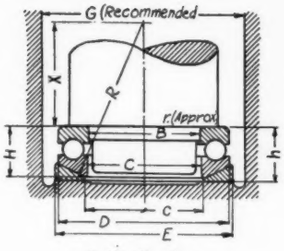
The marine standards division voted to recommend that the S. A. E. standard ⅞-18 spark plug shall be used for marine engines.

The division has also approved the use of the following S. A. E. standards for marine practice. The numbers given are the S. A. E. data sheet numbers:

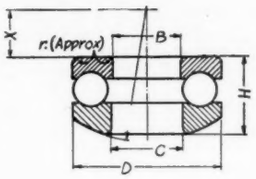
1—Adjustable yoke rod ends
1a—Plain yoke rod ends
2—Eye rod ends
2a—Yoke and rod end pins
2b—Cotter pins
3—Spark plug shells
4—Screw standard up to 1½ in.
4a—Screw thread tolerances
4a—Tap drills
4c—Large diameter screw thread
5—Lock washers
7—Square broached fittings
7b—Six-spline fittings
7c—Ten-spline fittings
7d—Four-spline fittings
9—Carbon steels
9—Screw stick
9—Steel castings
9a—Nickel steels
9b—Nickel chromium steels
9c—Chromium steels
9c—Chromium vanadium steels
9d—Silico-manganese steels
9d-9f—Heat treatments
11—Bearing metals
11—Phosphor bronze
12—Brass casting metals
12b & 12c—Manganese bronze sheets and rods
12d—Hard cast bronze
12d—Gear bronze
13—Aluminum alloys
13a—Brass sheets and strips
13b—Brass rods
13b—Tobin bronze rods
13c—Non-ferrous metal tubing
15—Round tension test-specimen
15xa—Flat tension test-specimen (standard)
15a—Flat tension test-specimen (alternate)
15xb—Shock test-specimen
15b & 15c—Gray iron test-specimens
15xd & 15d—Brinnell hardness test
16—Cold drawn seamless steel tubes
17—Bands and strips
29d & 29e—Roller bearings
35—Carbureter flanges, ½ to 2 in.
35xa—Carbureter flanges, 2½ to 3½
35a—Flared tube unions
35a—Gasoline pipe sizes
35b—Flared tubes, ells and tees
35b—Throttle levers
35d—Throttle lever throw
35c—Carbureter air heater
36—Magnetic dimensions
36a—Tire-pump base dimensions
38xa—Electric bulb bases, sockets and plug ends
40—Location of engine number
47—Oversize cylinders
47a & 47b—Piston-ring grooves
48-48b—Storage battery directions
48c—Electrical insulation requirements.
48n & 49o—Flexible steel tubing



Flat face type



Self-aligning



Steering knuckle type

Standard Metric Sizes for Ball Thrust Bearings

Standard Metric Sizes for Thrust Ball Bearings—Self-Aligning Type with Washer

Bearing Number	BEARING														WASHER							Bearing Number
	B		D		H		C		X		R		r		h		E		c		G	
	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	In.	
TS-M- 10	10	0.3937	30	1.18	14	0.55	12	0.47	10	0.39	25	0.98	1	0.04	15	0.59	35	1.38	14	0.55	1⅛	TS-M- 10
TS-M- 15	15	0.5906	35	1.38	15	0.59	17	0.67	13.4	0.53	30	1.18	1	0.04	17	0.67	38	1.50	19	0.75	1½	TS-M- 15
TS-M- 20	20	0.7874	42	1.65	16	0.63	22	0.87	16.6	0.65	35	1.38	1	0.04	18	0.71	45	1.77	25	0.98	2 1/16	TS-M- 20
TS-M- 25	25	0.9843	48	1.89	18	0.71	27	1.06	19.6	0.77	40	1.57	1	0.04	20	0.79	52	2.05	30	1.18	2¼	TS-M- 25
TS-M- 30	30	1.1811	53	2.09	18	0.71	32	1.26	17.8	0.70	40	1.57	1	0.04	20	0.79	59	2.32	35	1.38	2⅜	TS-M- 30
TS-M- 35	35	1.3780	62	2.44	21	0.83	37	1.46	23.8	0.94	50	1.97	1	0.04	23	0.91	67	2.64	43	1.69	2 11/16	TS-M- 35
TS-M- 40	40	1.5748	64	2.52	21	0.83	42	1.65	22.4	0.88	50	1.97	1	0.04	23	0.91	69	2.72	48	1.89	3 1/16	TS-M- 40
TS-M- 45	45	1.7717	73	2.87	25	0.98	47	1.85	28.5	1.12	60	2.36	1	0.04	27	1.06	78	3.07	53	2.09	3½	TS-M- 45
TS-M- 50	50	1.9685	78	3.07	25	0.98	52	2.05	32.8	1.29	65	2.56	1	0.04	27	1.06	83	3.27	58	2.28	3⅞	TS-M- 50
TS-M- 55	55	2.1654	88	3.46	28	1.10	57	2.24	33.6	1.33	70	2.76	1	0.04	30	1.18	94	3.70	64	2.52	4⅜	TS-M- 55
TS-M- 60	60	2.3622	90	3.54	28	1.10	62	2.44	38	1.50	75	2.95	1	0.04	30	1.18	96	3.78	69	2.72	4½	TS-M- 60
TS-M- 65	65	2.5591	100	3.94	32	1.26	67	2.64	38.4	1.51	80	3.15	1½	0.06	34	1.34	105	4.13	74	2.91	4⅞	TS-M- 65
TS-M- 70	70	2.7559	103	4.06	32	1.26	72	2.83	42.8	1.69	85	3.35	1½	0.06	34	1.34	109	4.29	79	3.11	4 11/16	TS-M- 70
TS-M- 75	75	2.9528	110	4.33	32	1.26	77	3.03	47	1.85	90	3.54	1½	0.06	34	1.34	114	4.49	84	3.31	4 15/16	TS-M- 75
TS-M- 80	80	3.1496	115	4.53	35	1.38	82	3.23	48.4	1.91	95	3.74	1½	0.06	37	1.46	124	4.88	89	3.50	5⅛	TS-M- 80
TS-M- 85	85	3.3465	125	4.92	38	1.50	88	3.46	55	2.17	105	4.13	1½	0.06	40	1.57	138	5.43	96	3.78	5 1/16	TS-M- 85
TS-M- 90	90	3.5433	135	5.31	38	1.50	93	3.66	59	2.32	110	4.33	1½	0.06	40	1.57	141	5.55	101	3.98	6	TS-M- 90
TS-M- 95	95	3.7402	140	5.51	41	1.61	98	3.86	60	2.36	115	4.53	1½	0.06	43.5	1.71	151	5.94	107	4.21	6⅛	TS-M- 95
TS-M-100	100	3.9370	150	5.91	41	1.61	103	4.06	70	2.76	125	4.92	1½	0.06	44	1.73	156	6.14	112	4.41	6¼	TS-M-100
TS-M-105	105	4.1339	155	6.10	46	1.81	108	4.25	69.5	2.74	130	5.12	1½	0.06	49	1.93	163	6.42	118	4.65	7	TS-M-105

Approved by B. & R. B. Division, March 28, 1917.

Standard Metric Sizes for Thrust Ball Bearings—Flat Face Type

Bearing Number	B		D		H		C		r		G	Bearing Number
	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	In.	
TP-M- 10	10	0.3937	30	1.18	12	0.47	12	0.47	1	0.04	1⅛	TP-M- 10
TP-M- 15	15	0.5906	35	1.38	14	0.55	17	0.67	1	0.04	1½	TP-M- 15
TP-M- 20	20	0.7874	42	1.65	14	0.55	22	0.87	1	0.04	2 1/16	TP-M- 20
TP-M- 25	25	0.9843	48	1.89	15.5	0.61	27	1.06	1	0.04	2¼	TP-M- 25
TP-M- 30	30	1.1811	53	2.09	15.5	0.61	32	1.26	1	0.04	2⅜	TP-M- 30
TP-M- 35	35	1.3780	62	2.44	18	0.71	37	1.46	1	0.04	2 11/16	TP-M- 35
TP-M- 40	40	1.5748	64	2.52	18	0.71	42	1.65	1	0.04	3 1/16	TP-M- 40
TP-M- 45	45	1.7717	73	2.87	22	0.87	47	1.85	1	0.04	3½	TP-M- 45
TP-M- 50	50	1.9685	78	3.07	22	0.87	52	2.05	1	0.04	3⅞	TP-M- 50
TP-M- 55	55	2.1654	88	3.46	24.5	0.96	57	2.24	1	0.04	4⅜	TP-M- 55
TP-M- 60	60	2.3622	90	3.54	24.5	0.96	62	2.44	1	0.04	4½	TP-M- 60
TP-M- 65	65	2.5591	100	3.94	27	1.06	67	2.64	1½	0.06	4⅞	TP-M- 65
TP-M- 70	70	2.7559	103	4.06	27	1.06	72	2.83	1½	0.06	4 11/16	TP-M- 70
TP-M- 75	75	2.9528	110	4.33	27	1.06	77	3.03	1½	0.06	4 15/16	TP-M- 75
TP-M- 80	80	3.1496	115	4.53	31	1.22	82	3.23	1½	0.06	5⅛	TP-M- 80
TP-M- 85	85	3.3465	125	4.92	34	1.34	88	3.46	1½	0.06	5 1/16	TP-M- 85
TP-M- 90	90	3.5433	135	5.31	36	1.42	93	3.66	1½	0.06	6	TP-M- 90
TP-M- 95	95	3.7402	140	5.51	38	1.50	98	3.86	1½	0.06	6⅛	TP-M- 95
TP-M-100	100	3.9370	150	5.91	38	1.50	103	4.06	1½	0.06	6¼	TP-M-100
TP-M-105	105	4.1339	155	6.10	40	1.57	108	4.25	1½	0.06	7	TP-M-105

Standard Metric Sizes for Thrust Ball Bearings—Steering-Knuckle Type

Bearing Number	B		D		H		C		X		R		r		Bearing Number
	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	Mm.	In.	
TS- 8	8	0.3150	22	0.87	14	0.55	8.5	0.33	0.00	0.000	15	0.59	1	0.04	TS- 8
TS-12	12	0.4724	32	1.26	15.5	0.61	12.5	0.49	11.00	0.433	28	1.10	1	0.04	TS-12
TS-17	17	0.6693	37	1.46	19	0.75	18	0.71	8.05	0.335	30	1.18	1	0.04	TS-17
TS-22	22	0.8661	46	1.81	24	0.95	23	0.91	11.00	0.433	38	1.50	1	0.04	TS-22
TS-24	24	0.9449	54	2.13	26	1.02	25	0.98	21.00	0.827	50	1.97	1	0.04	TS-24
TS-26	26	1.0236	60	2.36	31	1.22	27	1.06	21.00	0.827	55	2.17	1	0.04	TS-26
TS-30	30	1.1811	66	2.60	34	1.34	31	1.22	23.00	0.906	60	2.36	1	0.04	TS-30

Approved by B. & R. B. Division, March 28, 1917.

Automobile Calendar

ASSOCIATIONS AND CLUBS

May 25 — Cleveland, American Automobile Assn., Annual Meeting, Hotel Hollenden.
June 4-6—Hot Springs, Va., National Assn. of Automobile Accessory Jobbers, Convention.
Sept. 12-14—Atlantic City, N. J., Motor and Accessory Manufacturers, Mid-Season Meeting.
Sept. 25-28—Pittsburgh, National Assn. of Purchasing Agents, Convention.

CONTESTS
1917

May 30—Cincinnati, Ohio, 250-Mile Race.
May 30—Uniontown, Pa., Local Races.
May 30—Newark, N. J., Track. T. B. Shoemaker, promoter.
May 30—Washington, D. C., Track, Middle Atlantic Motor Assn.
June 16—Chicago, Ill., Speedway Race.
June 23 — Cincinnati, Ohio, Speedway Race.
July 4—Omaha, Neb., Speedway Race, Championship.
July 4—Uniontown, Pa., Speedway Race.
July 4—Tacoma, Wash., Speedway Race.
July 4—Visalia, Cal., Road Race,
July 4—Spokane, Wash., Track Race.
July 4—Benton Harbor, Mich., Track Race.
July 14—Rochester, N. Y., Hillclimb.
July 15—Missoula, Mont., Track Race.
July 17-19—Buffalo, N. Y., Intercity Reliability.
July 22—Anaconda, Mont., Track Race.
July 29—Great Falls, Mont., Track Race.
Aug. 5—Billings, Mont., Track Race.
Aug. 17—Flemington, N. J., Track Race.
Sept. 3—Uniontown, Pa., Speedway Race.
Sept. 3—Cincinnati, O., Speedway Race, Championship.
Sept. 6—Red Bank, N. J., Track Race.
Sept. 8—Hillclimb, Pike's Peak, for stripped stock chassis.
Sept. 15—Providence, R. I., Speedway Race, Championship.
Sept. 22—Allentown, Pa., Track Race.
Sept. 28—Trenton, N. J., Track Race.
Sept. 29—New York Speedway Race, Championship.
Oct. 6—Danbury, Conn., Track Race.
Oct. 6—Uniontown, Pa., Speedway Race.
Oct. 13—Richmond, Va., Track Race.
Oct. 13—Chicago Speedway Race, Championship.
Oct. 27 — New York Speedway Race.

SHOWS

May 5-13—Chicago, Used Car Show, Coliseum, Chicago Automobile Trade Assn.
June 20-27 — Montreal, Que., Used Car Show, Coliseum, Montreal Automobile Trade Assn.
Aug. 6-18—Fremont, Neb., General Tractor Demonstration.
Sept. 2-9—Spoken, Wash., Interstate Fair.
Sept. 9-15 — Milwaukee Show, State Park Fair, West Allis.
Sept. 9-15 — Milwaukee, Wis., Fall Show, Wisconsin State Fair, West Allis, Milwaukee Automobile Dealers.
Oct. 13-28—Dallas, Tex., Dallas Automobile & Accessory Dealers' Assn. State Fair.

S. A. E. Calendar

Midsummer Meeting

June 25-26—Washington, D. C.

Standards Division Meetings

MAY

22—Lighting, Detroit.
25—Aeronautic, New York.
29—Research, New York.

JUNE

5—Starting Battery, Detroit.
7—Engine, Detroit.
8—Transmission, Detroit.
14—Electric Vehicle, New York.
25—Standards Committee, Washington.

Section Meetings

MAY

17—Metropolitan Automobile Club of Amer., Engines that Will Burn the Fuels We Shall Have to Use. Papers by H. G. Chatain on the Diesel and P. O. Scott on the Junker.
18—Cleveland. Some New Phases in the Case Hardening of Steel, by J. H. Herron.
24—Detroit, Hotel Ponchartrain.
25—Indiana.

Engineering Calendar

American Railway Master Mechanics' Assn.
American Institute of Electrical Engineers.
Master Builders' Assn.
American Society of Heating and Ventilating Engineers.
Association Iron and Steel Electrical Engineers.
Mining and Metallurgical Society of America.
Society of Automobile Engineers.
Illuminating Engineering Society.
National Electric Light Assn.
National Gas Engine Assn.
American Society for Testing Materials.
American Institute of Metals.
American Foundrymen's Assn.
Society Naval Architects and Marine Engineers.

MAY

18—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
18—Illum. Eng. Soc., Engineers Club, Philadelphia. Progress Notes-Lamps and Lighting by Unit Rasin of Westinghouse. Dinner at the club 6.30 p.m.
19—Assn. Iron & Steel Elec. Engrs., Fort Pitt Hotel, Pittsburgh. Auspices of Power Committee, W. O. Oschmann, chairman. Power Cost Accounting Systems as Practised by Several Steel Mills in Pittsburgh District.
21—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21-24—Amer. Soc. Mech. Engrs. Spring meeting, Hotel Sinton, Cincinnati. Meeting of council, May 22, business meeting followed by machine shop and general sessions. Joint session with Nat. Mach. Tool Bldrs. Assn., with addresses by Dean Schneider and Dr. Otto P. Geier. May 23, munitions session. May 24, simultaneous sessions. Excursions, reception, smoker.
29-June 1 — Nat. Elec. Light Assn. Convention at Atlantic City.

JUNE

2—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
5-7—Nat. Gas Engine Assn. annual meeting at Chicago (Sherman House).
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
9—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Michigan section at Detroit.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13-14-15 — Amer. Ry. Master Mech. Assn. convention, Greek Temple, Atlantic City, N. J., Hdqrs. Marlborough-Blenheim Hotel.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
15—Illum. Eng. Soc. Pittsburgh section, Office Building, Lighting and Inspection Trip through City and County Building. Mr. S. G. Hibben.
16—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
18-19-20 — Master Car Bldrs. Assn. convention, Greek Temple, Atlantic City, N. J. Hdqrs. Marlborough-Blenheim Hotel.
20-22—Amer. Inst. Chem. Engrs., Ninth Semi-Annual Meeting at Buffalo.
21—Mining & Met. Soc. of Amer. New York section monthly meeting at Engrs. Club.
26-30—Amer. Soc. for Test Mat. annual meeting Atlantic City, Hotel Traymore. Business meetings, reception and golf tournament.

JULY

7—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
12—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
14—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
16—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

AUGUST

4—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
11—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
20—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
21—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

SEPTEMBER

1—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
10-14—Assn. Iron & Steel Elec. Engrs. annual convention at Phila.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
13—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
14—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
15—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.
17—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
20—Mining & Met. Soc. of Amer. monthly meeting N. Y. section at Engrs. Club.
24—Amer. Inst. Metals at Boston.
24—Amer. Fdry. Assn. annual meeting at Boston.

OCTOBER

6—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ill. section at Chicago.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mich. section at Detroit.
10—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Mass. section at Boston.
11—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penn. section at Phila.
13—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.
15—Amer. Soc. Heat. & Vent. Engrs. monthly meeting New York section.
17, 18, 19—Amer. Gas. Inst. at Washington, D. C.
18—Mining & Met. Soc. Amer. monthly meeting New York section Engrs. Club.
20—Assn. Iron & Steel Elec. Engrs. monthly meeting Pittsburgh section.

NOVEMBER

3—Assn. Iron & Steel Elec. Engrs. monthly meeting Phila. section.
8—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Penna. section at Phila.
9—Amer. Soc. Heat. & Vent. Engrs. monthly meeting Ohio section at Cleveland.
10—Assn. Iron & Steel Elec. Engrs. monthly meeting Cleveland section.